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THE FAMILY AND DENTAL DISEASE
I. DMF EXPERIENCE AMONG HUSBANDS AND WIVES*

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The study to be described here is based on detailed dental examinations of 3,490 Japanese married men and women residing at the Colorado River Relocation Center of the War Relocation Authority. Most of these 1,745 couples had lived, before war evacuation, in and about the City of Los Angeles or in the Southern California area. During the late winter of 1942 and the early spring of 1943, the marital couples volunteered for dental examinations, which were made with the aid of mirrors and explorers by dentists of Japanese ancestry. (Of the total of 3,490 individuals [1,745 couples], 1,846, located in Camp I, were examined by George Yamada and Toyo Shimizu. Located in Camp II were 878 individuals, who were examined by George Nishida. In Camp III, 756 individuals were examined by Michio M. Nakadate.) The findings were recorded by the methods used previously in the Hagerstown Dental Studies.[1] Analysis of the results of the mouth examinations reveals that there exists some association between the extent of dental disease experienced by husbands and by their wives. Findings on the dental status of the children of these couples will be given in the following papers in this series of reports.

Method

As in previous studies on the epidemiology of dental disease,[2, 3] the tendency to experience attacks was measured in

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1. Klein, Henry and Palmer, C. E.: Studies on Dental Caries. X. Procedure for Recording and Statistical Processing of Dental Examination Findings. J. D. Res., 19:243, June 1940.

2. Klein, Henry, and Palmer, C. E.: Dental Caries in American Indian Children. Public Health Bulletin 239, 1937.

3. Klein, Henry, and Palmer, C. E.: Epidemiology of Dental Caries. Proc. Bicent. Conf., Univ. Pennsylvania, 1940.

*Table 1.—Number of Japanese Husbands of Specified Ages Having Specified Numbers of DMF Teeth**

No. of DMF Teeth per Person	Index Case Group	Age Group of Husband												All Ages
		20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	
0	Low	2	2	5	9	11	2	3	2	4	—	—	1	41
1	DMF	2	6	2	9	4	3	4	3	2	—	—	—	35
2		3	12	5	11	9	4	9	8	6	2	—	—	69
3		1	8	6	6	11	6	4	5	7	2	—	—	56
4		1	12	4	13	12	8	7	9	6	—	—	—	72
5	Middle	1	4	5	2	10	3	7	4	6	2	3	—	47
6	DMF	1	11	14	3	12	4	5	14	5	1	—	—	70
7		—	7	7	6	12	5	5	11	9	—	—	—	62
8		1	5	11	10	13	9	6	12	8	2	—	—	77
9		2	7	6	9	15	4	6	8	6	4	1	—	68
10		2	6	8	3	11	8	8	4	6	3	1	—	60
11		1	5	5	5	12	5	12	8	12	7	1	—	73
12		—	8	8	9	7	3	4	6	7	5	—	—	57
13		—	4	7	6	10	7	9	8	9	6	—	—	66
14		1	7	1	3	9	4	3	11	3	2	—	—	44
15		—	6	4	7	5	6	5	7	3	3	—	—	46
16		2	7	5	2	7	3	6	12	4	3	3	—	54
17		—	4	5	4	1	3	5	11	5	2	2	—	42
18	High	—	5	6	3	6	6	7	4	9	2	1	—	49
19	DMF	1	5	4	3	5	2	6	9	5	5	—	—	45
20		—	1	3	4	2	2	6	12	7	6	1	—	44
21		—	4	5	4	5	3	2	6	8	5	3	—	45
22		—	3	4	2	4	2	2	6	4	3	—	—	30
23		1	1	3	5	2	4	6	8	6	2	1	—	39
24		—	—	1	3	3	1	4	9	7	5	2	—	35
25		—	1	2	1	5	3	3	6	12	6	—	—	39
26		—	1	—	3	4	2	5	7	5	4	1	—	32
27		—	—	1	2	4	1	3	4	9	3	2	—	29
28		—	1	1	1	1	1	5	3	7	3	—	1	24
29		—	—	—	1	3	—	2	3	1	3	—	1	14
30		—	—	—	—	1	—	—	—	5	—	1	—	7
31		—	—	—	2	—	—	—	2	—	1	1	—	6
32		—	—	—	2	7	8	34	64	86	44	20	3	268
All persons	All	22	143	138	153	224	121	193	286	279	136	44	6	1,745
Number of persons in index case groups														
Low DMF		7	44	41	48	69	35	56	88	77	39	9	1	514
Middle DMF		9	53	57	63	89	49	75	109	116	52	15	2	689
High DMF		6	46	40	42	65	38	62	89	86	45	20	3	542

*Data based on examination of 1,745 husbands residing at the Colorado River Relocation Center. (Material shown in table arranged in three index case groups as indicated by heavy separating lines.)

the marital couples in terms of the number of decayed, filled and missing permanent teeth (the DMF count).

Among any large group of persons, there will be found a number who have none or only a few DMF teeth. Others will be found to have many such teeth. The remainder will range between the

two extremes. Accordingly, individuals of given age and sex can be ranked on different levels of DMF experience according to the number of DMF teeth which they have. Hence, different persons of the same age and sex can be considered as having about the same tendency to experience attacks of caries if they all have the same number of DMF teeth, and other persons of the same age and sex can be ranked higher or lower in a scale of DMF experience if they show respectively larger or smaller numbers of DMF teeth.

It is desirable at this juncture to point out the limitations in present knowledge of what the DMF count means in adults. For children, it is generally recognized that the DMF count measures the accumulated experience with attack by dental caries. In adults, on the other hand, it measures other conditions in addition to caries experience. Although, in adults, the number of decayed and filled teeth clearly shows the extent of attack by dental caries, teeth in older persons may be removed or lost for reasons other than caries. The chief cause in the adult ages is obviously pyorrhea; but other conditions, such as scurvy and mouth infection, also may cause tooth loss. The DMF count in adults must be viewed, therefore, only as a rough index of the experience of an adult individual with caries and all those other conditions that cause loss of teeth. Accordingly, in the present study, the DMF count is used as a means of differentiating persons who show wide variation in dental disease experience without reference to the specific reasons for the presence of the DMF condition.

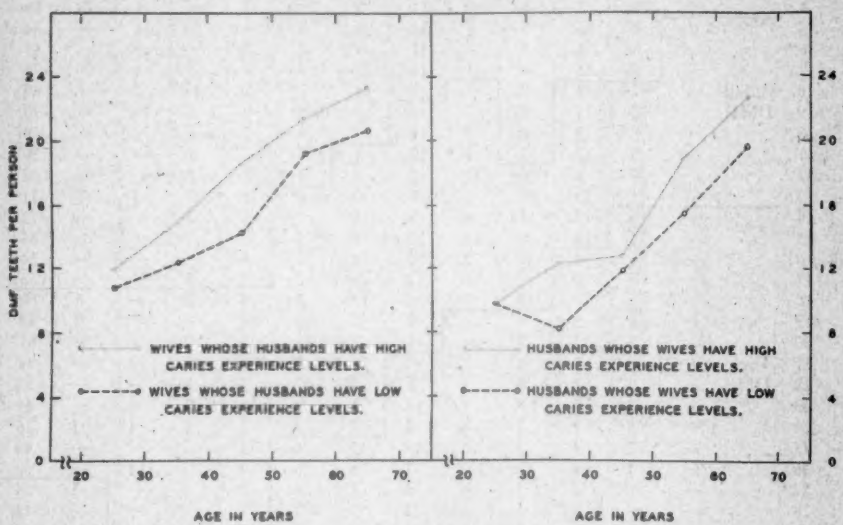

Fig. 1.—Relationship between age and number of DMF teeth for wives of men who have high levels of DMF experience and for wives of men who have low levels of DMF experience; relationship between age and number of DMF teeth for husbands of women who have high levels of DMF experience and for husbands of women who have low levels of DMF experience.

Basic data with regard to the DMF experience of 3,490 Japanese husbands and wives are given in Tables 1 and 2. The numbers of individuals having particular numbers of DMF teeth shown in these first two tables were then con-

*Table 2.—Number of Japanese Wives of Specified Ages Having Specified Numbers of DMF Teeth**

No. of DMF per Person	Index Case Group	Age Group of Wife 15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	All Ages
0	Low	—	9	8	4	4	7	7	—	1	1	—	—	41
1	DMF	—	8	5	2	3	7	3	1	1	—	—	1	31
2		1	2	10	2	4	5	5	4	1	1	—	—	35
3		—	6	12	2	8	7	8	4	1	—	—	—	48
4		1	6	7	6	6	11	7	10	3	—	1	—	58
5		1	8	13	3	7	11	6	3	—	1	1	—	54
6		—	8	8	1	5	11	8	3	1	—	—	—	45
7		—	9	15	4	11	14	6	7	1	3	1	—	71
8	Middle	—	11	14	3	7	9	14	7	2	—	2	—	69
9	DMF	—	12	15	8	7	14	7	6	—	1	—	—	70
10		—	5	12	6	5	12	17	4	2	3	2	—	68
11		—	9	13	2	8	12	7	7	—	1	—	—	59
12		—	9	9	10	10	8	8	4	2	2	—	—	62
13		—	11	13	9	6	9	10	8	1	3	1	—	71
14		—	6	17	11	8	9	11	7	1	3	—	—	73
15		1	4	16	6	10	10	9	5	2	1	—	—	64
16		—	5	8	6	2	10	14	5	4	—	—	—	54
17		—	3	6	7	3	12	16	3	4	2	—	—	56
18		—	5	10	10	9	6	13	8	4	3	—	1	69
19		—	11	9	4	5	2	5	10	—	1	—	1	48
20		—	3	13	4	4	11	7	14	2	3	—	—	61
21	High	—	—	7	6	1	7	11	7	2	3	1	—	45
22	DMF	—	2	5	1	3	8	5	7	5	1	—	—	37
23		—	3	3	6	7	10	4	7	1	3	1	—	45
24		—	3	1	7	4	5	7	3	3	1	1	1	36
25		—	2	1	5	3	7	12	8	2	—	—	—	40
26		—	1	4	3	3	7	6	6	4	3	1	—	38
27		—	—	3	2	4	8	7	4	2	3	—	1	34
28		—	—	1	1	1	3	7	1	1	—	—	—	15
29		—	—	—	1	1	5	3	2	—	—	—	—	12
30		—	—	—	1	3	3	9	1	1	2	—	—	20
31		—	—	2	—	1	—	5	—	2	1	—	—	11
32		—	—	3	3	7	29	50	41	36	24	11	1	205
All persons	All	4	161	263	146	170	289	314	207	92	70	23	6	1,745
Number of persons in index case groups														
Low DMF		2	56	78	43	58	82	88	60	27	22	8	1	515
Middle DMF		1	57	109	59	75	115	127	84	29	24	4	3	687
High DMF		1	48	76	44	47	92	99	63	36	24	11	2	543

*Data based on examination of 1,745 wives residing at the Colorado River Relocation Center. (Material shown in table arranged in three index case groups as indicated by heavy separating lines.)

verted into accumulated percentages by age groups. (The percentages were smoothed by straight line interpolation between the DMF class intervals. As a further process in the smoothing for the given age groups, the percentages were derived for and expressed at the midpoints of the DMF class intervals.) The

latter procedure provides a convenient mechanism for finding the third of persons of given age groups who have the fewest, as well as the third who have the most, DMF teeth. For example, a man aged 25 is observed to have one DMF tooth. As regards all the men of his age, he falls within the first three deciles; that is, in the 30 per cent having the fewest DMF teeth. On the other hand, another man of the same age shows twenty DMF teeth, falling within the highest 30 per cent of his age group; that is, he is in the group having the most DMF teeth.

By this method, the individual marital partners were separated into two classes: *(a)* those who fell among the lowest third in the scale of caries experience and *(b)* those who fell among the highest third. Thus, among the men examined, those 20-24 years of age who had two or fewer DMF teeth were selected as index cases, as were those 25-29 years of age who had five or fewer DMF teeth and so on. As shown by the heavy separating lines in Tables 1 and 2, a particular number of DMF teeth was established as the limit of the upper and lower thirds, and the individuals having this maximum or minimum number of DMF teeth were designated as index

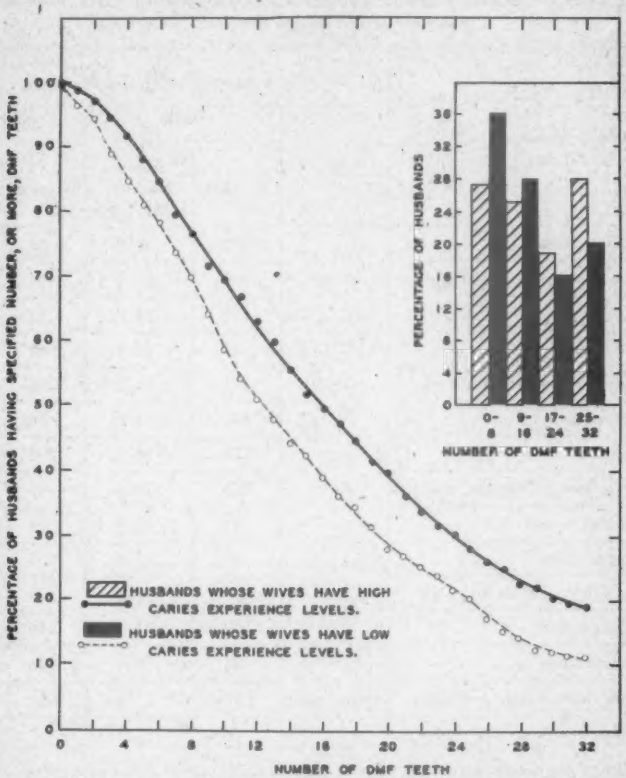

Fig. 2.—Percentage of husbands (all ages) having specified numbers of DMF teeth, or more, according to whether their wives have high or low levels of DMF experience.

cases. Hence, from the 1,745 men examined, 514 were selected as having a low DMF index and, by the same method, 542 (of the 1,745 men) were selected as having a high DMF experience index. Among the 1,745 women examined, 515 fell among the lowest third, whereas 543 fell in the highest third. The low and the high DMF index cases having been selected in the described manner, the caries experience of the marital partners was then examined.

*Table 3.—Number of Marital Partners and Mean Number of DMF Teeth in Marital Partners of Specified Index Cases**

Item Specified (All Ages)	Respective Marital Partners				
	Age	Wives		Husbands	
		Number	Mean Number DMF Teeth	Number	Mean Number DMF Teeth
Low DMF index cases	20-29	132	10.9	53	9.7
All index cases (low, middle and high)		437	11.4	165	9.7
High DMF index cases		117	11.8	45	9.6
Low DMF index cases	30-39	94	12.4	86	8.1
All index cases (low, middle and high)		316	14.3	291	11.1
High DMF index cases		102	15.0	98	12.4
Low DMF index cases	40-49	174	14.3	104	11.8
All index cases (low, middle and high)		603	16.8	345	12.1
High DMF index cases		196	18.6	94	12.7
Low DMF index cases	50-59	85	19.2	134	15.5
All index cases (low, middle and high)		299	20.0	479	17.6
High DMF index cases		90	21.4	149	18.8
Low DMF index cases	60 and over	27	20.6	138	19.6
All index cases (low, middle and high)		99	22.2	465	21.3
High DMF index cases		36	23.3	157	22.5

*Data arranged by age of marital partners of spouses of all ages in index cases.

Findings

The question in the present report may be stated as follows: When husbands or wives are taken as propositi, or index cases, what is the DMF experience of their respective spouses? More specifically, do the mates of those men or women who are among that third who have the greatest number of DMF teeth tend to have a higher than usual caries experience? And do the men or women who fall among that third having the fewest DMF teeth have marital partners showing a lower than usual caries experience?

The material given in Table 3 and in Figure 1 provides information in these respects. The data show the average number of DMF teeth represented in the various age groups among all the men and among all the women and, in con-

trast, the average number of DMF teeth represented respectively in the marital partners of the high and low DMF experience index cases. It is clear that the wives of men of high caries experience differ consistently from the wives of men of low caries experience. The difference between the two groups of wives (of husband index cases) appears at every age and averages about three DMF teeth.

The difference in the DMF experience of the two groups of wives of the husband index cases is shown again by the material given in Table 4 and depicted in Figure 2. (In this figure, the values are plotted on an all-age basis.) Wives (all ages) of men of low DMF experience have a consistently lower DMF rate than do the wives of men of high DMF experience. For example, among wives (all ages) of high DMF index men, about 27 per cent have as many as twenty-five to thirty-two DMF teeth; while among wives of men of low DMF index, fewer than 18 per cent have that many DMF teeth. Again, while nearly 34 per cent of the wives (all ages) of men of low DMF index have as few as none to eight DMF teeth, less than 21 per cent of the wives (all ages) of men having a high DMF index have that few DMF teeth.

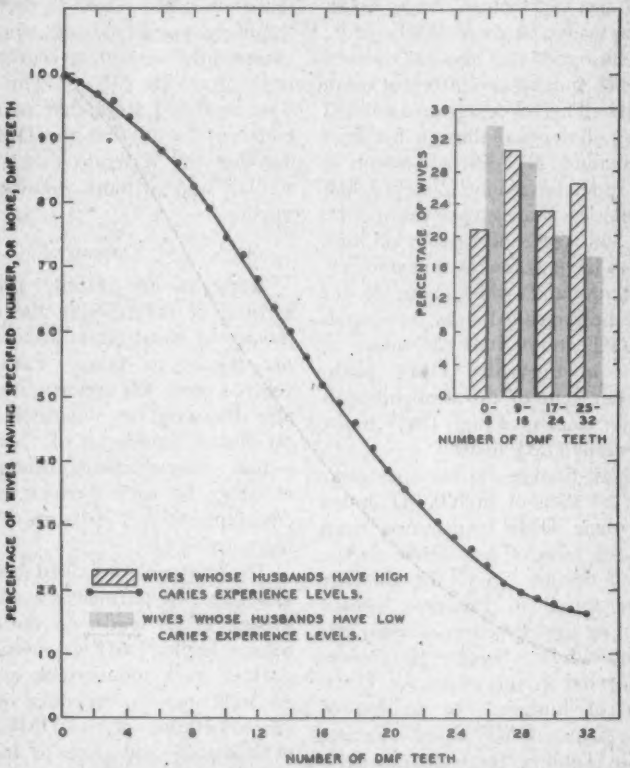
PERCENTAGE OF WIVES HAVING SPECIFIED NUMBER, OR MORE, DMF TEETH
NUMBER OF DMF TEETH
WIVES WHOSE HUSBANDS HAVE HIGH CARIES EXPERIENCE LEVELS.
WIVES WHOSE HUSBANDS HAVE LOW CARIES EXPERIENCE LEVELS.
PERCENTAGE OF WIVES
0-8
9-16
17-24
25-32
NUMBER OF DMF TEETH

Fig. 3.—Percentage of wives (all ages) having specified numbers of DMF teeth, or more, according to whether their husbands have high or low levels of DMF experience.

Somewhat parallel findings are encountered when cases in women are used as index. Hence, as shown in Table 3 and in Figure 1, the women of low DMF index have husbands who have fewer DMF teeth than do the husbands of women of high DMF index. As shown by the data given in Table 4 and in Figure 3, at the 50 per cent point, husbands (all ages) of women of low DMF index have twelve or more DMF teeth; while the husbands (all ages) of women of high DMF index have fifteen or more DMF teeth. The bar diagram included in Figure 3 shows also that 36 per cent of the husbands (all ages) of women of low DMF index have none to eight DMF teeth; while less than 27 per cent of the husbands (all ages) of women of high DMF index have as few as that number. On the other hand, while about 20 per cent of the husbands (all ages) of women of low DMF index have as many as twenty-five to thirty-two DMF teeth, about 28 per cent of the husbands (all ages) of the women of high DMF index have that many DMF teeth.

From these findings, it becomes clear that wives of men of high DMF index differ in their DMF experience from the wives of men of low DMF index. The wives deviate from the average DMF rate found in Japanese women (Table 3) in the direction of their respective husbands. Similar differences are encountered in the respective DMF experience of husbands of women of high, and of low, DMF index. Hence, as shown in Table 3, the husbands deviate from the average DMF rate found in Japanese men in the direction of their respective wives' indices.

Tests of the significance of these differences were made. The results indicate that the observed differences between the wives of men with high and low DMF indices could be expected, on the basis of chance variation, only six times out of 100,000 trials, while the observed differences between the husbands of women of high and low indices could be expected, on the basis of chance variation, only five times in 100,000 trials.

(As the examinations at the three camps that made up the Colorado River Relocation Center were conducted by different dentists, it was considered necessary to determine whether the differences among the examiners were sufficient to bring a bias to the data. This would be possible if one examiner were consistently a higher scorer of DMF teeth than the other. The data have been analyzed from that point of view, and it is found that the DMF rates by age for the separate camps are quite similar and without significant differences.)

Comment

Study of the family provides one method of determining the relative influence of constitution and environment on disease in man. Particularly, in marital pairs, the opportunities are available for weighing separately the effects on disease tendencies of: *(a)* the individual characteristics brought to the marriage by each partner and *(b)* the environment they share in common during married life.

The material described here makes it clear that the partner of a spouse having a high DMF tends, on the average, to have a higher DMF experience than the partner of a spouse with a low DMF. As indicated by the data of Figure 1, the association of the DMF experience of husbands and wives is found at the earliest ages (presumably at the time of marriage) and therefore it would appear that persons with large numbers of DMF teeth tend to marry persons who, on the average, have more than the usual number of DMF teeth. The same situation seems to be true of persons with good teeth; i.e., they tend to marry persons who, on the average, have fewer DMF teeth than usual for their age and sex.

From inspection of the data furnished in Figure 1, it may be noted that the slopes of the trend lines in DMF experience with increasing age does not differ two pairs of trend lines depicting the increase of DMF experience with age. The results indicate that the small differences in slope fall well within the range

Table 4.—Number of Husbands and of Wives Having Specified Number of DMF Teeth, and Percentage of Husbands and of Wives Having Specified Number of DMF Teeth, or More, According to DMF Experience Levels of Their Respective Spouses

No. of DMF Teeth	Low DMF Index Cases in Wives		High DMF Index Cases in Wives		Low DMF Index Cases in Husbands		High DMF Index Cases in Husbands	
	Husbands				Wives			
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
0	19	100	6	100	20	100	8	100
1	12	96.3	9	98.9	13	96.1	9	98.5
2	27	94.0	14	97.2	15	93.6	6	96.9
3	22	88.7	16	94.7	17	92.7	15	95.8
4	20	84.5	20	91.7	19	87.4	16	93.0
5	13	80.6	18	88.0	25	83.7	10	90.0
6	25	78.1	27	84.7	13	78.8	12	88.2
7	18	73.2	17	79.7	25	76.3	17	86.0
8	30	69.7	22	76.6	27	71.4	19	82.8
9	29	63.9	16	72.6	23	66.1	24	79.3
10	21	58.3	14	69.6	21	61.7	18	74.9
11	18	54.2	21	67.0	16	57.6	19	71.6
12	16	50.7	17	63.2	15	54.5	23	68.1
13	19	47.6	26	60.0	24	51.6	20	63.8
14	9	43.9	19	55.2	17	46.9	21	60.1
15	18	42.1	12	51.7	15	43.6	21	56.3
16	14	38.6	13	49.5	18	40.7	18	52.4
17	9	35.9	14	47.1	18	37.2	16	49.1
18	15	34.2	17	44.6	15	33.7	24	46.1
19	17	31.3	10	41.4	9	30.7	17	41.7
20	8	28.0	18	39.6	19	29.0	17	38.6
21	8	26.4	13	36.3	14	25.3	12	35.4
22	7	24.9	11	33.9	7	22.6	13	33.2
23	12	23.5	8	31.9	9	21.2	14	30.8
24	6	21.2	12	30.2	11	19.5	11	28.2
25	15	20.0	10	28.0	9	17.3	13	26.2
26	11	17.1	7	26.2	8	15.6	15	23.8
27	5	15.0	11	24.9	11	14.0	7	21.0
28	8	14.0	4	22.8	4	11.9	6	19.7
29	3	12.2	10	22.1	3	11.1	5	18.6
30	2	11.8	2	20.3	5	10.5	6	17.7
31	1	11.5	3	19.9	3	9.5	3	16.6
32	58	11.3	105	19.3	46	8.9	87	16.1
All	515	—	543	—	514	—	542	—

for the two groups of wives. The same consideration holds for the husbands. Statistical significance tests were applied to the differences in the slopes of the of chance variation. These findings suggest therefore that, although men with a low DMF tend to choose wives with a lower than average DMF rate, after

marriage the rates at which the teeth of the husband and wife are attacked by dental disease are more or less independent of each other; that is to say, exposure to the influences of a common environment during married life does not appear to increase or decrease perceptibly the DMF characteristic originally brought to the marriage by each marital partner.

It should be recognized that age is such a powerful influence in the accumulation of DMF teeth that its effect may well mask and cover the perhaps more subtle and slighter influence of the exposure of one spouse to the DMF susceptibility of the other over the period of married life. On the other hand, it has been shown that a relationship, slight but definite, does exist between the DMF experience levels of husbands and wives. Since more than half the teeth were decayed, missing or filled by early adulthood, and since during marriage there seems to be little effect on the intrinsic DMF rate of either partner, it becomes reasonable to infer that the DMF susceptibility is established perhaps as a pattern, sometime before marriage and probably during the years of early growth and development. The finding that the wives of men of low DMF have consistently fewer DMF teeth at every age than those shown by wives of men of high DMF suggests that each group of wives has reached its respective (and different) DMF level before marriage, because of characteristically different yearly rates of accumulation of DMF teeth from childhood to the time of marriage.

The point might be made that the relationship between the DMF experience of husbands and wives is based on socio-economic conditions; that is, it could be postulated that the well-to-do tend to marry the well-to-do and, because of better opportunities for dental care, have fewer decayed, missing and filled teeth than persons of poorer economic status. Other studies[4, 5] have clearly shown that socio-economic status does not significantly influence DMF experience. Hence, even though there may be social and economic factors in mate selection, such factors probably do not enter in the determination of DMF experience.

(Social and economic conditions obviously would influence the condition of the teeth after they were attacked by dental disease. Thus, persons of the higher economic groups would tend to intermarry and the marital partners would probably, even though they each had a large number of DMF teeth, tend to have well-preserved teeth because of the adequacy of dental care which their socio-economic status would tend to ensure.)

The association of DMF experience levels in husbands and wives shown in the present study could hardly be the result of conscious choice of mate in that respect. Undoubtedly, many complex variables play a role in the phenomenon. Propinquity may be one factor of some influence in accounting for it. In general, people who marry tend to come from about the same local geographic area. This may be particularly true for the Japanese couples. (About 70 per cent of the 1,745 couples were born in Japan. Among the index cases, about 60 per cent of the couples were born in Japan.) It may be assumed, therefore, that the husbands and wives spent their childhood in the same general geographic and relatively segregated areas in Japan, where environmental conditions shared during their early growth, and associated genetic-constitutional

4. Klein, Henry, and Palmer, C. E.: Community Economic Status and Dental Problem of School Children. Pub. Health Rep., 55:187, February 2, 1940.

5. Klein, Henry, and Palmer, C. E.: Medical Evaluation of Nutritional Status. X. Susceptibility to Dental Caries and Family Income. Milbank Memorial Fund Quart., 20: 169, 1942.

conditions and cultural peculiarities (characteristic of the particular localities) experienced in common by the partners during their youth, might account in some measure for the finding that their DMF experience levels tend to be related.

The observation that the dental disease experience levels of marital partners are associated is consistent with the view of human biologists that like tends to mate with like. For example, persons of particular eye color are inclined to select mates of similar eye color and those of a particular nationality tend to marry others of similar rather than of different nationality.[6, 7, 8] Recently Moore and Hughes[9] have indicated dentofacial resemblances that are to be found among husbands and wives.

This kind of phenomenon, which has been termed "assortative mating," has also been observed among certain members of the lower species.[10, 11]

Summary

Persons who have high levels of experience with dental disease (large numbers of DMF teeth) tend to marry persons who, on the average, have more than the usual number of DMF teeth for their age and sex. A parallel situation holds for persons who have good teeth (low DMF); i.e., they tend to marry persons who have, on the average, fewer DMF teeth than usual for their age and sex.

TECHNIC FOR NONMECHANICAL PREPARATION OF CAVITIES AND PROPHYLAXIS

Robert B. Black, D.D.S., Corpus Christi, Texas

Dentistry, of all the medical arts, has the unenviable distinction of offering the most widely feared service. Although much of this attitude toward dental care can be attributed to psychologic conditions rather than to actual pain, it is a fact that a very large percentage of people neglect their teeth, or avoid the dentist entirely, because of that traditional deep-seated dread of having the teeth operated upon. While we are all more or less sensitive regarding it, we accept this fact in a fatalistic manner as something that always has been and no doubt always will be.

The profession has ever been eager to do everything possible to minimize the patient's discomfort. Much has been accomplished in this direction. The extraction of teeth, an operation that used to be an ordeal, has, since the introduction and perfection of the local anesthetic, been accepted by most patients as nothing to be feared. Even the pain formerly associated with cavity preparation has been reduced by constant refinement in the employment of steel burs, the introduction of diamond instru-

6. Willoughby, R. R.: Somatic Homogany in Man. Human Biol., 5:690, December 1933.

7. Pearl, Raymond: Studies in Human Biology. Baltimore: Williams and Wilkins, 1924.

8. Holmes, S. J.: Human Genetics and Its Social Import. New York: McGraw-Hill Book Co., 1936.

9. Moore, G. R., and Hughes, B. O.: Familial Factors in Diagnosis, Treatment and Prognosis of Dento-Facial Disturbances. Am. J. Orthodontics 28:603, October 1942.

10. Pomerat, C. M.: Mating in Limulus Polyphemus. Biol. Bull., 64:243, 1933.

11. Jennings, H. S.: Assortive Mating, Variability and Inheritance of Size in Conjugation of Paramecium. J. Exper. Zool., 11:1, 1911.

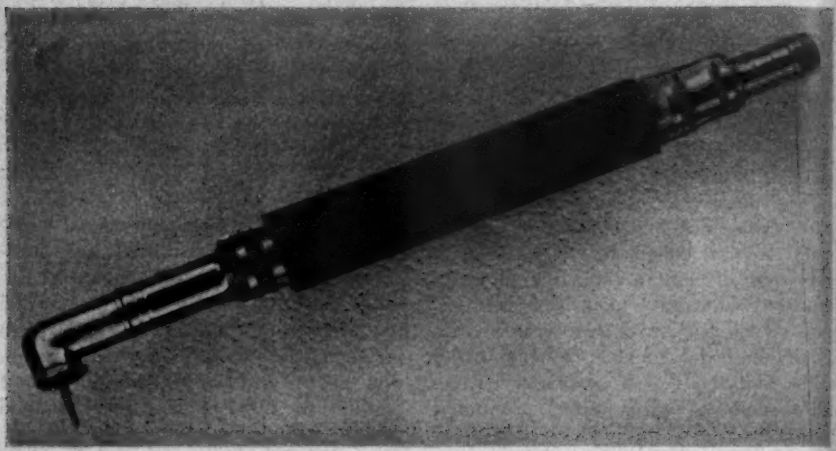

Fig. 1.—One of earlier experimental handpieces, with which considerable work was done both on patients and on extracted teeth. A separate vacuum attachment was held in the operator's left hand, while the handpiece was held in the right hand.

ments and the water cooling technic for dissipating the heat created during the preparation. Anesthetics also have found a definite place in minimizing the patient's tension and fear during cavity preparation.

In spite of these improvements, and many others not mentioned, the public has an aversion to visiting the dentist, and the principal source of this deep-seated, psychologic dread is the dental "drill." How many times have we seen patients sit down in the operating chair and look up at the drill with an expression of fear or apprehension! In the opinion of many men in the profession, there has always been a tremendous need for a new cutting principle which can be applied satisfactorily in tooth structure without employment of the drill. When the day comes that the dental profession can take care of its patients efficiently without the use of the drill, the greatest psychologic "bugaboo" will have been eliminated.

Mechanical means of cavity preparation involving the use of steel burs, stones and, more recently, the diamond instruments, while satisfactory from the operator's viewpoint, are still regarded as highly unpleasant by the patient. The purpose of this paper is to describe an entirely different approach to the problem, based upon a fundamentally different principle, which will be referred to throughout this paper as the "airbrasive" cutting principle.

The word airbrasive is an abbreviated combination of the words air and abrasive. It was coined because of the lack of a suitable existing word to describe this process. As this term indicates, the airbrasive process employs for its action a very fine—almost pinpoint—stream of compressed air into which a suitable finely divided abrasive agent has been introduced.

Distinction Between Airbrasive and Sand Blast

Airbrasive differs from sand blast in two respects: (1) it does not use sand as an abrasive agent, and (2) it does not employ a diffuse or blast type of air

stream as does the sand blast. In contrast, a well-defined, sharply focused type of air-abrasive stream is utilized. This eliminates the necessity for templates as used in industrial work and

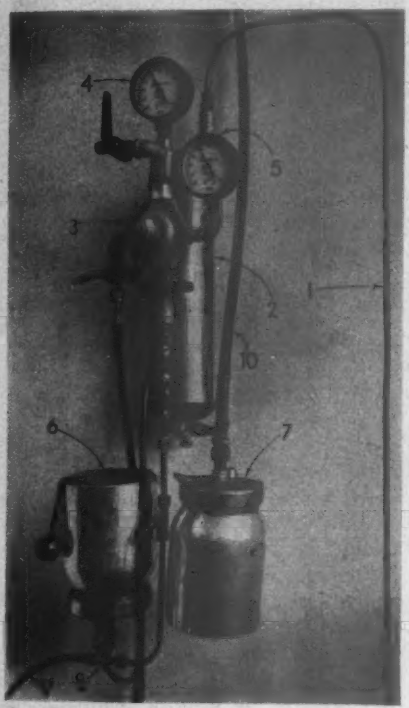

Fig. 2.—Original airbrasive unit. *1*, main airline connection. *2*, water-trap. *3*, pressure regulator. *4*, main line pressure gage. *5*, operating pressure gage. *6*, container for storing abrasive, which is mixed with air in mixing valve (*8*). *7*, receptacle in which abrasive returning from mouth through vacuum hose (*10*) is trapped. *9*, high-pressure hose through which airbrasive mixture is led to handpiece.

gives us a precise control over the cutting action.

Analysis of the conventional methods of cutting tooth structure reveals that there are four factors in the patient's adverse reactions to cavity preparation:

1. Pressure. In order to carry out the cutting action, considerable pressure must be exerted against the tooth. Many people are acutely conscious of this pressure and are under constant tension in fear that the operator's hand may slip and the instrument puncture the gums, tongue or cheek.

2. Heat. Because of the pressure applied to the point of contact, together with rotation of the bur or stone, great frictional heat is liberated at this point. If it is not conducted away, by a stream of water for example, an appreciable proportion penetrates the tooth. Some believe that to be the commonest source

Fig. 3.—Use of earlier airbrasive instrument at chair. The left hand holds a vacuum device for withdrawing the abrasive from the mouth, the handpiece being held in the right hand. No finger bracing is necessary as there is no reaction between handpiece and tooth. At the right is the air-pressure control device.

of pain during cavity preparation.

3. Vibration. Because of the mechanical contact or linkage between the patient's tooth and the revolving bur or stone, which is in turn directly connected to a fairly heavy handpiece firmly held by the operator, a reaction which is most unpleasant occurs. This mechanical vibration is transmitted through bone conduction directly to the brain of the patient.

4. Unpleasant sounds. Many patients maintain that the hum or grinding sound made during the cutting process is the source of greatest irritation. While this is no doubt largely psychologic, arising from association with the other three factors, it has a definite place in the average patient's aversion to the drill.

By utilization of the airbrasive principle, these four sources of psychologic and physical discomfort to the patient are completely removed. The tooth is subjected to no detectable pressure during the operation. There is no vibration whatsoever, and what heat is created is dissipated as fast as it is released. There is no mechanical connection between the instrument and the tooth, and the only audible sound associated with the cutting operation is a slight hiss of the air stream, which patients say is not objectionable.

Additional advantages gained through the utilization of the airbrasive principle are:

1. Elimination of tension on the part of the operator, as no finger bracing is necessary during the cutting process.

2. Elimination of danger to soft tissues.

3. Increased cutting speed.

It is fortunate that, although a powerful medium for cutting hard structures, this has practically no effect on the soft tissues. If the cutting stream is inadvertently directed against the mucosa or the finger, no injury is done.

Theory of the Airbrasive Cutting Principle

In theory and in practice, the utilization of the airbrasive cutting principle provides us with an entirely different method for cutting tooth structure. For this reason, the cutting characteristics of the instrument and the patient's reactions to the process are also entirely different from those associated with the mechanical cutting method. To prepare a cavity by the use of revolving burs or stones, it is necessary to apply pressure to the tooth. Byproducts of this pressure are frictional heat, vibration, plus the necessity of tightly bracing the fingers against the teeth, and the ever present danger of the instrument's slipping. The mechanical energy from the motor through the bur or stone is applied directly to the tooth surface to obtain cutting or abrasive action. Heat, vibration and pressure are intrinsic byproducts of this cutting method. By utilization of the airbrasive principle, involving the employment of an air-driven abrasive, the mechanical energy from the motor is first converted into kinetic energy as the abrasive particles pass through the cutting jet or nozzle and are charged with sufficient energy to promote the cutting action. The lack of pressure against the tooth associated with this method is due to the fact that the mechanical energy is not applied directly to the area being cut, but is first converted into kinetic energy. The lack of vibration is due to the fact that the abrasive particles are too small to create sufficient impact to

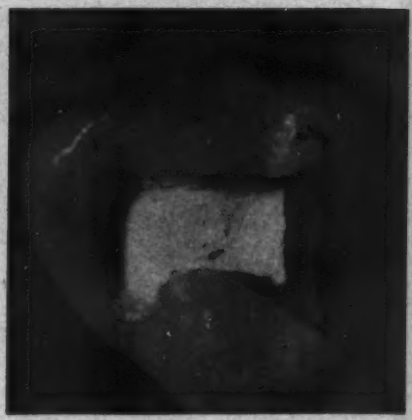

Fig. 4.—Class two cavity preparation in extracted tooth, which was cut entirely by means of airbrasive handpiece, using 180 mesh aluminum oxide and air at 80 pounds per square inch. This was originally a noncarious tooth.

be detected by the patient. The lack of heat is due to the fact that it is dissipated by the rapidly expanding air the instant that it is liberated by the impact of the particles.

To obtain cutting action with abrasive requires a combination of movement of abrasive surface and pressure applied between abrasive and area being cut. It is a fundamental fact that the pressure required to obtain the cutting action is inversely proportional to the speed with which the abrasive travels. The reason considerable pressure is required to obtain the cutting action by means of burs and stones is that the surface speeds of these instruments are slow. The reason the use of diamond disks proves a definite advantage is that these instruments are used at high speeds, resulting in the tooth's being subjected to less pressure. The airbrasive method subjects the tooth to practically no pressure because of the fact that it imparts to the abrasive speeds that would be utterly unobtainable with mechanically driven burs. At 90 pounds pressure per square inch, the abrasive particles are driving at an estimated speed of about 1,200 feet per second.

It is an equally important fact that the heat created during the cutting action increases directly proportionally to the pressure exerted against the tooth. In other words, the slower the speed of the abrasive surface and the greater the pressure, the greater the amount of heat liberated. Conversely, the slighter the pressure exerted and the higher the rate of speed of the abrasive, the lower the degree of heat liberated. The airbrasive principle affords the ultimate abrasive speed obtainable. Consequently, less pressure is recorded than for any other known cutting method. It might be added that what heat is created during the action is at once dissipated by the rapidly expanding air accompanying the abrasive.

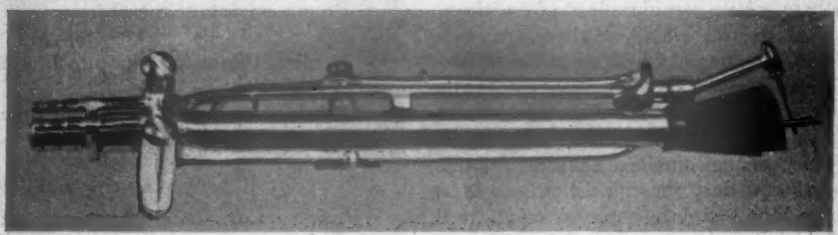

Fig. 5.—Abrasive handpiece. The hose attachment is at the left. The larger attachment is connected with the vacuum hose and the two smaller attachments supply air to the secondary jet at 100 pounds per square inch, and an air-abrasive mixture to the primary jet for the cutting action. The two valves for controlling the air are at the left end of the handpiece, while the finger control for starting and stopping the cutting action is at the right. At the extreme right are the contra-angle head and primary or cutting jet. Under this is the plastic vacuum hood for receiving the spent abrasive. The secondary jet, which extends out to the right of the vacuum hood, directs a stream of air in such manner as to lead the spent abrasive and tooth structure into the vacuum zone.

Factors in the Design of the Airbrasive Equipment

Essentially, there are only two basic considerations in designing equipment to apply the airbrasive principle:

1. A fluid medium for carrying the suspended abrasive and imparting the necessary energy to the abrasive to promote the cutting action.

2. An abrasive agent that will rapidly and efficiently cut tooth structure.

The first requirement of the carrying medium is, of course, that it be nontoxic.

In addition, it must be reasonably inexpensive and flow freely. Fluids considered abrasive carriers are liquids, water for example, and gases, such as compressed nitrogen, carbon dioxide and air. It is obvious that any of these mediums mentioned, and others not mentioned, would be, to a greater or less degree, satisfactory as an abrasive carrier. In some industrial applications of this principle, it has been found advantageous to use a specially developed oil as a carrier. At the present time, it seems that compressed air provides us with the most nearly ideal carrying medium as it is readily available and inexpensive, and there are no considerations of toxicity.

As regards abrasives, there are many that may be used and many others that it would be inadvisable to use in the mouth. Among the most commonly used industrial abrasives are silicon carbide, silicon dioxide, aluminum oxide, diamond dust (having a hardness of 10 on Moh's scale), boron carbide, steel, feldspar, glass and pumice. Among the softer abrasives are rottenstone, chalk, rouge and putty powder. Diamond dust, while it would no doubt be satisfactory for dental use, can be eliminated because of its expense. Silicon carbide and silicon dioxide are undesirable for two reasons: (1) although having a hardness of 9.5, they are brittle, breaking up easily on impact, and (2) although it is unlikely, the operator may acquire silicosis.

Of the abrasives tried, aluminum oxide seems to be the most nearly ideal. For dental use, it should be chemically pure, dust free and of 180 to 320 mesh fineness. Aluminum oxide has the following favorable characteristics: 1. It is a chemically stable, absolutely nontoxic substance. 2. It is inexpensive. 3. In normal times, it is readily obtainable. 4. It flows freely, having no great affinity for water. 5. It is of a neutral color.

I have been supplied with a quantity of boron carbide, a more recently developed abrasive and the hardest of all man-made materials, having abrasive properties rivaling those of the diamond. It is possible that boron carbide may have definite advantages over aluminum oxide. At the present time, I am unable to furnish any more data.

In designing the equipment for dental use of the airbrasive principle, four problems were encountered:

1. The difficulty of making small jets having an inside diameter of from 0.015 to 0.020 inch.
2. Rapid wear of the jet (the jet of the nozzle is the only part of the entire equipment subject to wear).
3. Proper mixing of the abrasive with the air.
4. Ridding the air of moisture before mixing with abrasive.
5. Efficient recovery of the abrasive from the area of operation.

Prospects of Longer Lasting Jets

The first jet or nozzle constructed was cast of hard gold around a graphite core. The graphite core was first turned down to the dimensions desired for the inside diameter. Casting wax was then built up over the graphite core, then turned down to the desired outside dimensions of the nozzle. In consideration of the time required to make this type of jet and its limited service life, it was apparent that something better would have to be developed.

Vitallium was the next material tried, and while it proved much more satisfactory than hard gold, it still did not last long enough to justify the time and expense involved in its construction.

At the suggestion of R. B. Mills, the jets being used at present are constructed of fine stainless steel tubing having an inside diameter of 0.022 inch and an outside diameter of 0.035. They are approximately five-sixteenths inch in length. Each jet will last sufficiently long for preparation of two medium size cavities. As the wear takes place almost entirely

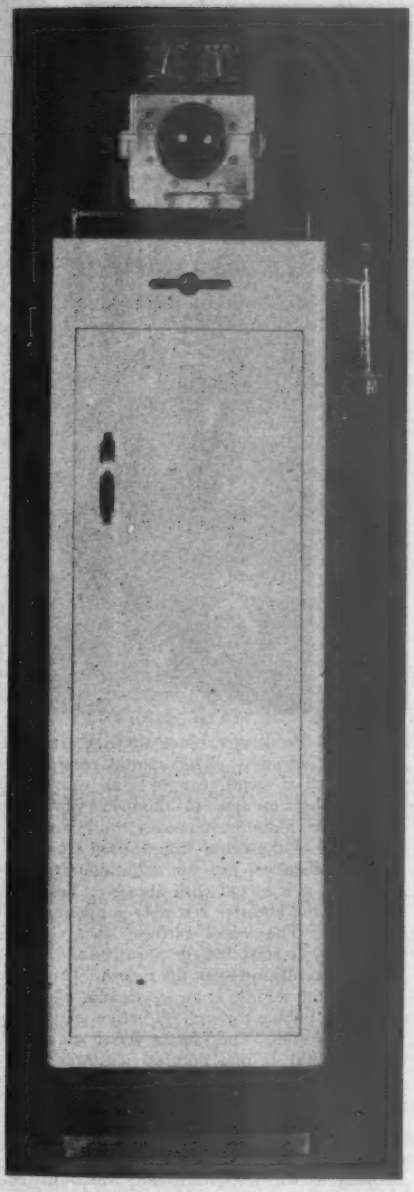

Fig. 6.—Front view of airbrasive unit, showing air regulating assembly and pressure gages. The large plastic knob in the center controls the operating pressure, which is shown in the gage to the left. This pressure varies from 25 to 85 pounds per square inch depending on the type of work being done. The two small plastic knobs on the side control the flow of air to the primary and secondary jets of the handpiece. The two knobs on the left control the air to the pressure relief valve into an accessory that may be attached when needed. The handpiece shown at the right is suspended from an automatic clip, which starts the motor compressor unit when the handpiece is lifted and stops it when the handpiece is put back. The master switch is shown in the center just above the door.

at the orifice of the jet when wear is apparent, it is simply reinserted with the ends reversed and it is now ready for preparation of two more medium size cavities before being discarded. The present cost of these jets is about 1 cent each.

As has been mentioned, the hardest of all man-made materials is boron carbide. Consequently, when it is possible to construct nozzles of this material, the problem of wear will be largely eliminated. Boron carbide nozzles used for industrial sand blasting are said to outlast cast iron nozzles from 700 to 1,000 times. When it is considered that boron carbide must be submitted to a pressure of 2,500 pounds per square inch and a temperature of 4,450 F. while being molded, the problems encountered in making such a small nozzle can be appreciated.

As regards the proper mixing of abrasive with air, it is of utmost importance to obtain a smooth, even mixture of the fluid and abrasive that can be easily controlled. It should be possible by means of control to govern the number of abrasive particles in a unit volume of air at any given time. There are several means by which it is possible to mix the abrasive with air, all of which seem to have advantages and disadvantages. The mixing device on the equipment being displayed is similar in principle to those used on industrial granite carving equipment.

Although aluminum oxide seems to have no great affinity for moisture, a dehydrator was installed principally as a

precautionary measure against any possibility of caking of the abrasive. In the original unit, only a water trap and no dehydrator was used, with entirely satisfactory results. The dehydrator is simply a vessel charged with silica gel through which the air must pass before coming in contact with the abrasive. The silica gel, having a powerful affinity for water, completely dries the air.

The one necessary feature of the equipment that has proved the greatest problem is efficient removal of the abrasive from the mouth after impact against the tooth. In the early stages, a small transparent hood was constructed around the jet, in which a vacuum hose was connected; the theory being that the hood would permit the operator to observe the progress of the operation and, at the same time, prevent the abrasive from scattering. This approach to the problem was unsuccessful because all transparent materials tried became etched or frosted on the inside surface, this destroying their transparency after a few minutes of use. Among the materials tried were glass, transparent plastic, cellophane and latex rubber. The rubber gave much longer service before transparency was diminished than did the other, harder materials.

At present, the problem is partially overcome by means of the employment of 302 mesh abrasive instead of the coarser 180 mesh, and by the use of a secondary jet which is especially designed and located to direct the abrasive into a zone of vacuum, where the particles are attracted to a receptacle in the unit.

Most of the other problems have been to a greater or less degree eliminated. The two factors requiring further refinement are the mixing apparatus for incorporating the abrasive with the air and recovery of the abrasive from the mouth. Elimination of these, in my opinion, should not be difficult with research and development. As has been mentioned, the equipment being displayed at this meeting is merely an approach to the problem, and although its construction was based on about two years' experience, it was built for demonstrations and for making possible further investigation and research.

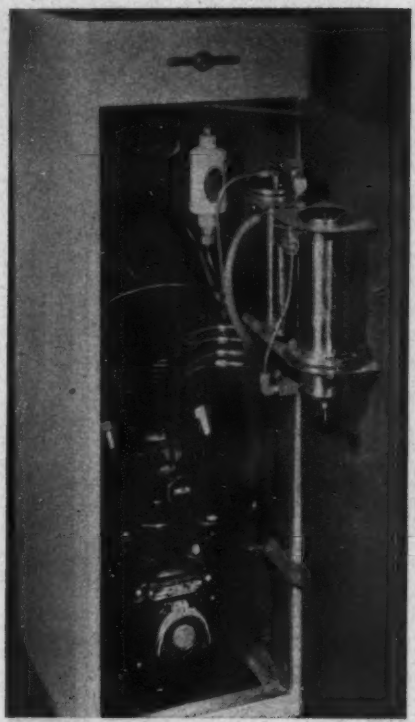

Fig. 7.—Inside of cabinet, showing arrangement of assembly. The motor compressor unit, which is silent, can be seen suspended from rubber mounts to dampen vibration. Above the motor compressor unit are the lower half of the water trap and oil separator and the silica gel cell for dehumidifying the air before it is mixed with abrasive. For convenience, the abrasive assembly is mounted on the door. The vessel farthest away is the receptacle, or trap, for the abrasive and tooth structure returning from the mouth. The glass vessel in the middle is an air cleaner allowing the air to bubble through oil before going into the compressor. The closest vessel stores the abrasive that is incorporated with the compressed air in the mixing valve at the bottom. The plastic knob controls the abrasive mixture.

Similarly to conventional dental equipment, the airbrasive equipment is composed of a unit and a handpiece. The unit contains a small silent motor and a compressor, an abrasive vessel and a means of controlling the mixture of abrasive with air and a vacuum recovery receptacle with filter, which stores the used abrasive. Other secondary features of the unit are an adequate water trap, which removes suspended water particles from the compressed air, a diaphragm controlling mechanism for regulating the air pressure to the handpiece, a relief valve for leading off excess air and a silica gel dehydrator for drying the air before it is mixed with the abrasive. There is also an oil filter for freeing the air of any trace of abrasive before it is returned to the compressor.

The compressor is used for two purposes, to compress the air for the primary or cutting jet, and the secondary or abrasive recovery jet, and, secondly, to create a vacuum retrieving the abrasive from the mouth. The handpiece, in general appearance and dimensions, is quite similar to the conventional handpiece. It differs principally in that it is entirely nonmechanical, containing no moving parts whatsoever. As has been said, the cutting tip or jet is the only part of the entire equipment subject to wear.

The operation of the handpiece is controlled entirely with the index finger, no footpedal being needed. To describe it a bit more in detail, it is basically composed of three features: 1. The nozzle and a small valve and tube to lead the abrasive air mixture to it. 2. The vacuum device for recovering the abrasive and powdered tooth structure, including the vacuum tube, which makes up the body of the handpiece, and the secondary jet, which sweeps the abrasive into the vacuum zone. 3. The finger control for regulating the starting and stopping of the cutting process as desired.

The handpiece is connected with the unit by a compact rubber tube bundle made up of two five-thirty-seconds inch high pressure tubes and one three-eighths inch suction tube, which for compactness are vulcanized together. The air pressure, which seems more desirable for the cutting process, is from 80 to 90 pounds per square inch. Pressure in excess of 90 pounds produces rapid nozzle wear, out of proportion to any slight increase in cutting speed, while, as the pressure is reduced from 80 toward 50 pounds, the cutting action is markedly diminished. This phenomenon is utilized in prophylactic work since pressures of 25 to 40 pounds, while adequate to remove stain, seem to have no injurious effect on the enamel. Of course, for prophylactic work, it would no doubt be still safer to use a softer abrasive, such as pumice, rather than aluminum oxide at reduced pressure. For the secondary jet, a pressure of 100 pounds is used. As has been mentioned, its purpose is to direct the abrasive, after impact with the tooth, into the vacuum zone, where it is drawn back to a receptacle in the unit.

Cutting Characteristics

Because the airbrasive method of cutting tooth structure is based upon an entirely different principle, its cutting characteristics and the technic employed for the operation are correspondingly different. A wall being cut by a fissure bur, for example, is always parallel to the long axis of the bur; while, in cutting a similar wall with the airbrasive instrument, the long axis of the nozzle is held at an angle approximately 30 degrees to the surface being cut. In the case of the mechanically driven bur, the cutting takes place only at the point of contact between the bur and the tooth; while, with the airbrasive instrument, it must be remembered that there is at no time any mechanical contact between the nozzle and the area being cut. Therefore, even though the instrument is held sta-

tionary, the cutting action will proceed ahead of the nozzle. These facts constitute no problem whatsoever. They are simply mentioned because it is necessary for the operator to familiarize himself with the cutting characteristics associated with this instrument before intelligently applying it. As a matter of fact, once one has become familiar with the use of this instrument, it involves much less tension, strain and consequent fatigue than use of the conventional mechanically driven instrument. No finger bracing is necessary and the hand and fingers are in a state of relaxation while operating. The grip used is generally the pen and pencil grip without finger bracing.

Prophylaxis

Little has been said thus far in regard to the use of this instrument in the field of prophylaxis. Prophylaxis as an operation involves more time and tedious effort in proportion to the fee than any other dental operation. The airbrasive principle provides us with a much more rapid and efficient means of removing stain. It is especially efficient when the stain is located in deep pits and sulci and cannot be reached by mechanical instruments.

There is much that remains to be done to determine the ideal abrasive for prophylactic use. While, up to the present time, aluminum oxide has been used for this purpose at reduced pressure, in the final analysis it would undoubtedly be better to use some softer abrasive, such as pumice, with higher air pressure. Another advantage of this principle in regard to dental prophylaxis is the fact that the abrasive is being constantly carried to the handpiece and from there to the area being cleaned. This saves considerable time to the operator that would otherwise be consumed in reaching for more pumice and waiting for the patient to expectorate. A saliva ejector should be used in conjunction with airbrasive prophylaxis in order to eliminate this necessity.

It is hoped that, in the future, it will be possible to construct specially shaped jets for removal of supragingival calculus. Also, there is much to be done toward perfecting the vacuum recovery of the abrasive.

Preventive Dentistry

While, up to the present time, no actual work has been done in the field of preventive dentistry, this principle should give us an ideal medium for the elimination of precarious conditions such as the presence of deep sulci and pits in the teeth of children. At the present time, stones and diamonds are being used for this purpose, and while they are reasonably satisfactory from the operator's point of view, it is anything but pleasant to the child owing to the pressure, vibration and heat and the associated sounds. The airbrasive principle provides us with a medium for accomplishing this important operation rapidly, efficiently and with complete freedom from pressure vibration and heat and, last of all, that grinding sound which nobody likes, not even little children.

Other uses for which this cutting principle may be used to advantage are treatment of traumatic occlusion, relief of high cusps, artificial restorations and the removal of old or faulty amalgam fillings.

The greatest effort should be made in the development of this instrument for use in operative dentistry, for it is in this field of work that the patient is subjected to the greatest discomfort, which contributes to the unfavorable psychologic reaction intrinsically associated with dental service.

Up to the present time, only class one and class five cavities have been prepared in the mouth. Class two cavities have been cut on extracted teeth with complete success. It is possible that, with further development and refine-

ment, we may be able to prepare all types of dental cavities. For all kinds of amalgam restorations, this instrument may be used as a sole means of cavity preparation. This includes cavity excavation, outline form, convenience form, retention form and beveling of all margin angles. For the removal of any soft caries areas present, a spoon or excavator must be used because, as was previously mentioned, this medium will not cut soft materials.

Considering the number of pulps that have been exposed because of easy penetration of the dental bur, it should be considered a distinct advantage that this is the case.

Patient's Reaction to Use of Instrument

Patients upon whom this instrument has been used, although limited in number, have without exception a definite preference for it.

The first preparations were carried out on a patient for whom I had previously filled eight cavities, using the dental bur for excavation. This case is pointed out as an example because the patient was nervous in the chair and her teeth were moderately to extremely sensitive. Three cavities were prepared completely by the airbrasive method and restored with amalgam. The first preparation made was on the lingual surface of the upper left first bicuspid. It was extended well into the dentin and, when completed, included about half the area of the lingual surface. The time required to complete the operation was approximately four minutes. When the patient was told that the cavity had been prepared, a hand mirror was necessary to convince her that anything had been done to the tooth. The other two cavities prepared and filled were class one, in the lower right, first and second bicuspids. The patient was enthusiastic regarding the complete lack of any disagreeable sensation during these preparations. In consideration of the fact that she was a typical nervous patient with teeth more sensitive than average, the results were more than gratifying.

Porcelain Jacket Preparations

While no porcelain jacket preparations have as yet been made in the mouth, experiments have been carried out on extracted teeth in this connection. It can be definitely stated that enamel may be rapidly and safely removed over broad areas with little, if any, sensation of heat. A rubber dam certainly should be employed for this operation in order to isolate the tooth being prepared and to insure that no abrasive shall reach the patient's throat. Fissure burs or stones must be used for finishing the shoulder.

Conclusion

It is impossible to say at this time just what percentage of the operative work can be done completely with the airbrasive method. No doubt, where extreme precision is required, such as for abutment preparation, inlays and three-quarter crowns, burs, stones and diamond instruments should be employed to sharpen the angles. For class two preparations for inlays, this instrument should be used in conjunction with diamond disks or other suitable instruments for the buccomesial and linguomesial or distal line angles. Even though the airbrasive instrument could be employed for only 50 to 80 per cent of the total cutting in any given case, its use would be justified.

It can at this time be said definitely that, in the airbrasive principle, we have a new medium for cutting enamel and dentin painlessly, rapidly and silently. Therefore, the method described justifies further investigation, research and development.

AIR-CONDITIONED HANDPIECE*

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The need in dentistry for some method that would enable the operator in the process of cavity preparation to obtain a better view of the operative field is an urgent one. Actually to see the operative field, unobscured by débris, while the bur is revolving in the tooth structure would be a tremendous aid to better and more rapid operating. At the present time, the view of the cavity is clear only until the bur has made a few revolutions, when again vision of the exact drilling area is obscured by the fine sawdust-like filings of tooth material or by an occasional dribble of saliva. The accuracy of the preparation becomes dependent on the frequent use of the compressed-air blast, the chip blower or a warm water irrigation. While the actual drilling proceeds, we are relying on our sense of touch, our mental picture of the final preparation and a knowledge of the anatomy of a tooth to minimize the possibility of mechanically exposing the pulpal structures. With these aids and the frequent changing of cotton rolls, periodic use of the air blast or warm water irrigation, we achieve good results. A careful operator will find it necessary to make from four to twelve such movements during cavity preparation. A day full of such interruptions can become very grueling.

Some dentists, preferring a clear field at all times, will enlist the services of their chair assistants to operate the air-gun, constantly blowing a stream of air on the tooth being prepared. This method greatly improves vision and expedites the operation. It has the distinct disadvantage of requiring the uninterrupted aid of a chair assistant to apply the air concurrently with the burring. It is too much to expect an intelligent girl to stand beside the chair constantly for many hours rendering such assistance. Other operators elect to prepare cavities routinely under a constant flow of warm water. This method aids in cooling the tooth and obviates overheating the vital structures.

It does have certain distinct disadvantages that make it impractical for most operative procedures. Its use is limited largely to posterior mandibular teeth and to gross excavations where accurate vision is not essential. In employing a flow of water on the upper jaw, the stream pours down on the mirror, distorting the cavity image much as a spoon is distorted in a glass of water. In addition, the water must be eliminated, sometimes an unwieldy process and difficult in certain chair positions.

The abdominal surgeon makes an incision for appendectomy and, before further dissection, clamps and ties off the blood vessels so that vision of the wound is clear and unimpaired. He does not dare to incise or dissect with the field obscured by bleeding or without knowing exactly where the cutting edge of the scalpel lies. It is interesting to observe the current movies of aircraft workers in defense plants. The tradesman boring holes in the wing of a plane operates the drill simultaneously with a flow of compressed air to increase the accuracy of his work. The dentist is expected to perform a finer operation with the cutting edges of a bur obscured by tooth filings, saliva or blood.

We do, then, as progressive and skil-

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ful operators, urgently need some method by which to maintain clear vision as we drill the tooth. We need some device to eliminate tooth particles, decay débris, dribbles of saliva and oozing blood, and to lessen the demand for cotton rolls than thermal shock was the cause of pain.

Design

Such a method for simultaneously drilling a tooth and keeping it clean

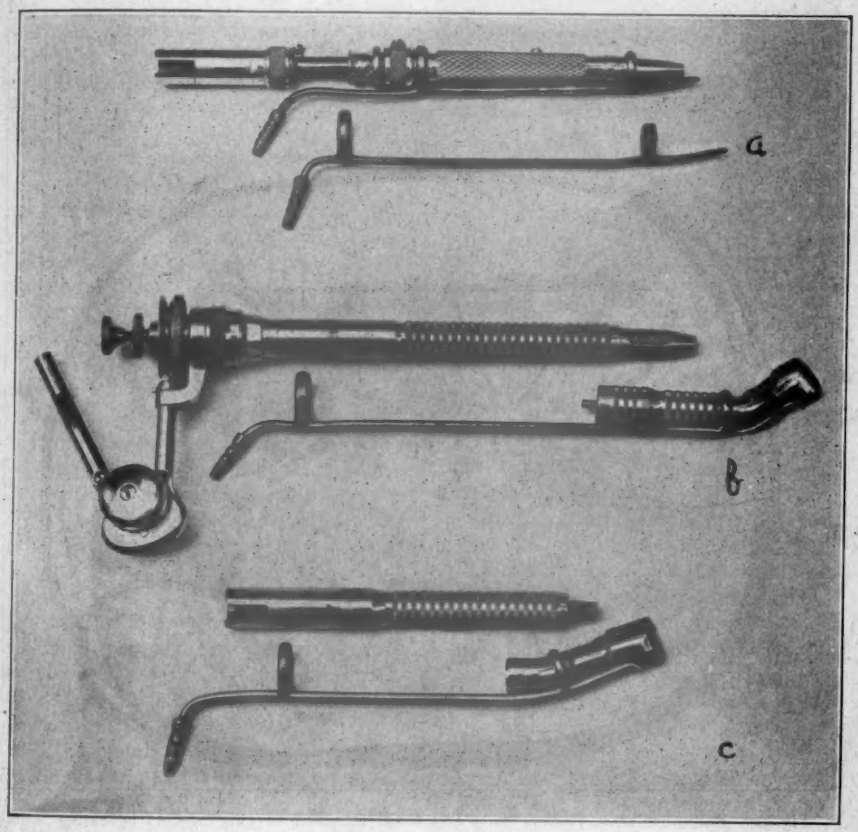

Fig. 1.—*a*, 14-gage round orthodontic tubing soldered to two cast rings, which slide onto handpiece. *b* and *c*, appliances for straight handpiece and contra-angle attachment.

while we are operating. Furthermore, we need some means to eliminate thermal changes as a cause of pain in cavity preparation, some means to nullify the effects of friction heat. With such a device, we could reserve local anesthesia for those cases wherein trauma other while operating has been designed by Victor H. Carpenter, of Boston. His device is known as the air-conditioned handpiece. With one instrument, the operator obtains the desired double-duty action. It consists of a piece of 14-gage round orthodontic tubing sold-

ered to two cast rings, which slide onto the handpiece. (Fig. 1 *a*.) The rings are held in place by screws tightened and countersunk into depressions drilled in the sheath of the handpiece. The metal tubing has an attachment at the back end of the handpiece for a rubber tubing, which leads to the air gun of the dental unit. At the bur end, the metal tubing is bent to conform to the contour of the finger section of the handpiece and thus gives the flow of air a fixed aim as the operator prepares the cavity. A similar metal tube bent to the desired angle is prepared and made fast by screws to the contra-angle. It is as easy to slip this device on the straight handpiece as it is to apply the contra-angle itself. These appliances can be fashioned for any straight handpiece or for any contra-angle attachment. (Fig. 1 *b* and *c*.)

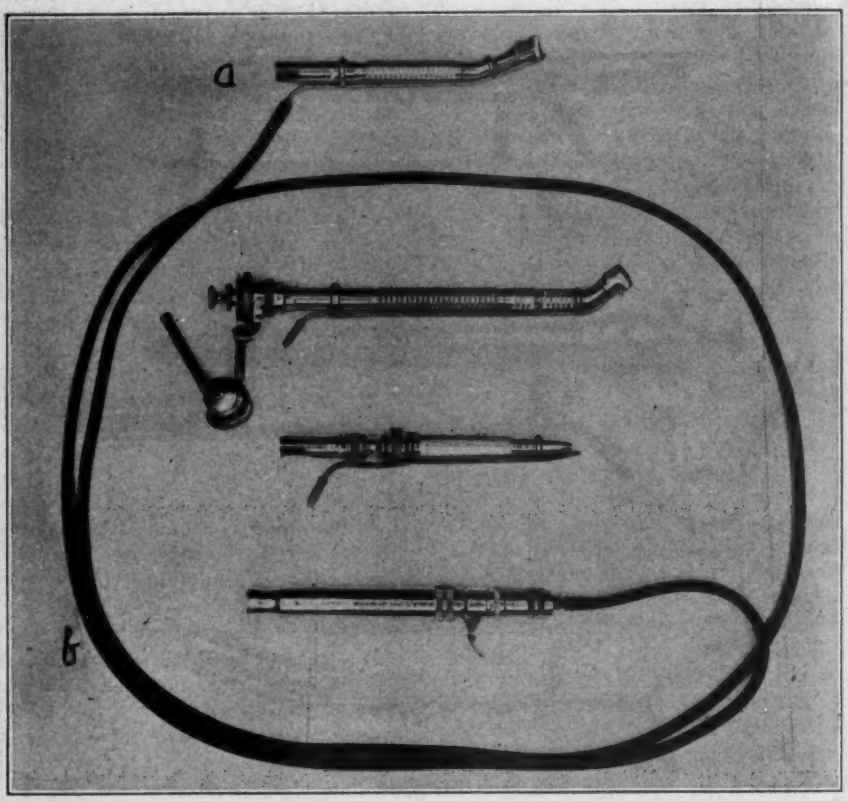

Fig. 2.—End of tubing, from 3 to 4 feet long, attached to gun on unit operating room-temperature air flow. *a*, slip-joint handpiece; *b*, tubing. The operating unit air-gun is shown below.

As previously mentioned, the other end of the tubing, which is from 3 to 4 feet in length, is attached to the gun on the unit that operates the room-temperature air flow. (Fig. 2 *a* and *b*.) The gun is strapped to the left arm-rest, just where the patient's thumb would normally

fall. (Fig. 3.) Ordinary 6-inch buckle straps are employed. During the drilling of a tooth, the patient can be instructed to press the lever down whenever the handpiece is inserted in the mouth and to release the valve when the handpiece is removed. Patients seem to be amused by the novelty of the idea and are pleased to be occupied while undergoing treatment. The patient-control method seems to distract them from the operation, making the procedure more tolerable.

With another method of operating the air-conditioned handpiece, a heavy elastic is twisted around the air-gun thumb valve, closing it against the gun so that the valve is kept open at all times. Then, by merely opening the main thumb valve on the unit, the air flow can run constantly while the operator proceeds. This act can be performed by the chair assistant or by the dentist himself.

In its simplest form, namely the metal tubing on the handpiece, the rubber tubing attached to the air gun and operating with patient control, the double-action air-conditioned drill is adapted for ready usage. To prevent its coming in contact with the engine belt, the rubber tubing near the handpiece is covered with a long spiral spring. (Fig. 2 *a*.)

A more convenient method of opening the air outlet makes use of the solenoid valve. This valve makes it possible to synchronize the foot rheostat with the air outlet so that, when the foot pedal is kicked over to start the motor, the air flow is released, ceasing when the motor is stopped. The principle of the electromagnet underlies the function of the solenoid valve. When the electric current is turned on by means of the foot control, an electromagnet attracts the valve on the air line and releases the flow of air. The solenoid valve is inserted in the line at the base of the unit.

The patient-control method is preferable to the automatic device since there are occasions when a constant flow of air is undesirable, as in finishing synthetic porcelain restorations. Intermittent blasts of air, if desired, can, with brief instructions from the operator, be readily given by the patient. Moreover, the patient-control arrangement has great value in distracting the patient during cavity preparation and in offsetting the tendency to squeeze something in anticipation of pain.

Fig. 3.—Left arm-rest on chair; showing air gun controlled by patient's left thumb for self-administration of air flow.

A further refinement of the air-conditioned handpiece is the incorporation of the rubber tubing in the operating arm by means of two chromium plated sleeves covering the usual two lower arm sections. The tubing is concealed in the upper arm by insertion through the hollow section of one of the parallel arms. With this design, the only region where the rubber tubing is visible is at the joints of the arm. Here, a small loop in the tubing gives sufficient play for easy movement of the handpiece in any direction.

Advantages

Whatever arrangement of the handpiece is employed, the same effect is acquired in operating. Clear vision of the cavity is obtained during the actual drilling procedure. To be able to see perfectly the actual spot where the bur is rotating on the gingival floor of a

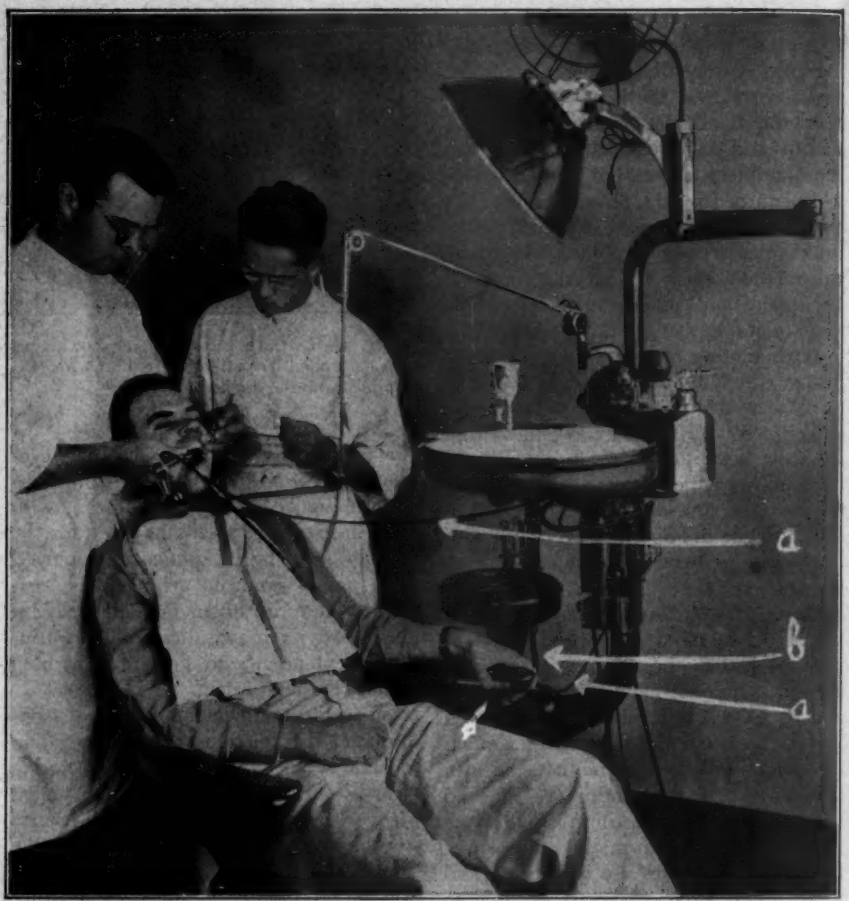

Fig. 4.—Air-flow handpiece device set up as unit with patient-control attachment; operator wearing face shield. *a*, air line. *b*, patient control with unit air-gun strapped to arm rest.

difficult distal cavity in a lower second molar is amazing to the operator who has struggled for years with saliva, débris, cotton rolls, bleeding gingivae, etc. The gentle air flow dispels the filings of tooth material or carious débris so efficiently that no particles are visible during cavity preparation. In addition, the continuous air-flow dissipates the friction heat of drilling and minimizes the pain due to thermal change. The use of the air-conditioned handpiece thus benefits both the patient and the operator.

It has been observed that a bur rotating in the perfectly dry air-cooled field will clog a great deal less and cut with greater speed. Without the air stream, the blades of a sharp bur will clog almost immediately. For this reason, a used bur cuts better when operating with the air flow. This is important in war time when the supply of new burs is curtailed.

In preparing an anesthetized tooth,

without the air, it is of course necessary to apply the bur intermittently in order to avoid injury to the pulp. We are constantly mindful of the fact that too rapid drilling overheats and destroys the vital structures. Cautious application of the bur at brief intervals to permit the friction heat to dissipate is mandatory. With the use of a continuous stream of air to cool the tooth and the bur, the danger of overheating is greatly minimized, and more rapid operating can be employed.

Table 1.—Trial Series of Time Records of Compound Cavity Preparations Using Carpenter's Air-Flow Handpiece

(Local Anesthesia)

Tooth	Type of Cavity	Tooth Structure	Condition of Marginal Ridge	Operative Time Black's Preparation	
				Min.	Sec.
12	DO	Hard	Old amalgam	3	30
5	DO	Average	Intact ridge	3	40
4	DO	Average	Intact ridge	3	30
12	MOD	Average	Intact ridge (both)	4	55
12	MO	Hard	Old amalgam	5	35
28	DO	Hard	Intact amalgam	2	22
29	DO	Average	Intact amalgam	3	16
21	MO	Average	Intact amalgam	2	34
12	DO	Soft	Intact amalgam	2	49
13	DO	Average	Intact amalgam	4	8
29	DO	Average	Intact amalgam	3	22
29	DO	Soft	Intact	3	44
4	MO	Average	Intact amalgam	5	15
12	DO	Solid	Intact amalgam	2	49
4	DO	Hard	Caries under old amalgam-near-exposure	4	35
12	MOD	Solid	Intact amalgam	6	15
14	MO	Soft	Old amalgam	4	3
19	MO	Hard	Intact amalgam	5	10
14	DO	Average	Intact amalgam	3	28
3	DO	Average	Intact amalgam	4	35
18	DO	Average	Intact amalgam	4	19
19	DO	Average	Intact amalgam	3	6
2	MO	Average	Intact amalgam	4	15
15	DO	Average	Ridge broken	4	30
14	DO	Average	Occlusal amalgam	2	50
30	DO	Average	Intact	3	30
3	MO	Average	Occlusal amalgam	4	25
19	DO	Solid	Intact	3	51
			Average Time	3	56

Reports of Research Men on Thermal Control

Several men in the operative field have undertaken tests to determine the temperature increases in the tooth from the friction of drilling a cavity. Henschel,[1] who has done some interesting work on thermal control, has recorded temperatures up to 250 F. with ordinary operative speed, in drilling a tooth outside the mouth. H. K. Warner, of the Australian College of Dentistry, University of Melbourne, states that the local temperature at the bur may exceed 250 C., while the temperature of the pulp may be as low as 50 to 60 C. This demonstrates a certain amount of insulating power in the dentin, plus the fact that most of the heat generated is absorbed by the tooth structure itself or dissipated

into the oral cavity. Henschel feels that it is not the total heat produced that is harmful, but the amount transmitted to a few dentinal fibrils by a small bur and conveyed to a few odontoblasts. It must also be borne in mind that the pulp is a circulating fluid structure and that it has some capacity to absorb thermal change in conjunction with the body's heat-regulating mechanism. For these reasons, a continuous stream of air that not only absorbs some of the friction heat, but also dissipates it throughout the mouth is adequate as a heat absorbent. It is not necessary to employ the more awkward water flow.

Time Tests with Air

The most startling feature of the double duty handpiece is the reduction in time consumed in cavity preparation to approximately one half. In a series of time tests on patients with compound cavities in posterior teeth, with marginal ridges intact in almost all cases, Black's technic for Class II cavities was followed faithfully. (Fig. 4.) A group of control cases without the air flow were timed,

Table 2.—Control of Series of Time Records of Compound Cavity Preparation Without Use of Carpenter's Air-Flow Handpiece

(Local Anesthesia)

Tooth	Type of Cavity	Tooth Structure	Condition of Marginal Ridge	Operative Time Black's Preparation	
				Min.	Sec.
4	DO	Solid	Intact ridge	8	
29	MO	Average	Intact ridge	9	7
29	MO	Average	Large old amalgam	5	8
13	DO	Soft	Intact old amalgam	7	51
12	DO	Solid	Intact old amalgam	6	35
5	DO	Solid	Intact old amalgam	9	30
4	MO	Average	Intact old amalgam	9	42
5	MO	Average	Intact old amalgam	7	22
12	DO	Average	Intact old amalgam	6	
20	DO	Average	Intact old amalgam	10	5
29	DO	Average	Old amalgam	11	18
29	DO	Soft	Broken	5	40
12	MOD	Average	Intact amalgam (both)	8	25
19	DO	Average	Intact amalgam	11	55
14	MO	Solid	Old amalgam	12	5
19	MO	Average	Old amalgam	10	
2	DO	Average	Old amalgam	12	
30	MO	Solid	Broken	11	32
18	DO	Average	Broken	7	15
32	MO	Average	Intact amalgam	10	26
14	MO	Average	Intact amalgam	9	27
5	DO	Average	Intact amalgam	5	33
21	DO	Deep caries	Intact amalgam	11	23
20	MOD	Deep caries	Intact ridge	13	11
21	DO	Solid	Intact ridge	7	44
12	DO	Solid	Intact ridge	6	48
12	DO	Solid	Intact ridge	5	9
1	MO	Hard	Intact	15	
14	DO	Average	Intact	9	27
			Average Time	8	46*

*Comparison of time tests: Average time with air: 3 minutes, 56 seconds; average time without air: 8 minutes, 46 seconds.

simulating as closely as possible the types of compound cavities prepared in the experimental group. (Fig. 4.) All cases, both control and air-flow, were anesthetized with 2 per cent procaine so that pain might not be a factor in the time consumed.

It may be fairly accurately concluded from these tests that the operating time in cavity preparation can be cut by approximately one-half. Any opinion drawn from such tests must necessarily be of a general nature owing to the variables involved. Such factors as the patient's cooperation, the amount of caries present and the texture of the tooth must be taken into consideration. Shortening the time 50 per cent is accomplished by eliminating the frequent use of the chip blower, warm water irrigation and cotton rolls. The elimination of heat by the air also makes possible more constant bur application, as the danger of overheating of the pulp can be minimized.

As previously stated, all cavities reported were prepared under 2 per cent procaine with 1/50,000 epinephrine content. In the Navy, the free use of local anesthesia can be employed. The men and women treated are of higher physical standards generally and the possibility of harmful effects from indiscriminate use of procaine is negligible. To say that cutting cavity preparation time in half and making an effort to allay all pain with local anesthesia are appreciated by Naval men is a mild statement. A dentist could not treat a more grateful group of patients. They refrain, as a whole, from manifesting the usual reaction to pain and discomfort.

It was observed in the foregoing tests that, after drilling through a marginal ridge without using air, the bur, when squeezed between the finger tips, was found to be extremely warm. If the same test is followed, using the air stream, the bur feels comparatively cool in spite of what might be considered abusive grinding. Pain in cavity preparation, it is agreed, is due to the heat caused by the contact of the revolving bur with the tooth and to the purely mechanical trauma of an instrument, revolving or not, in contact with sensitive dentinal tubuli. The use of air eliminates friction heat as a pain stimulus, while the other pain stimuli can be diminished by the use of small sharp burs, cautious operating or anesthesia. Thus, the use of anesthesia can be cut 50 per cent and can be reserved for those cases where nonthermal stimuli predominate.

By virtue of being able to reduce by at least half the actual drilling time in cavity preparation, the patient is saved considerable mental strain and the operator much of the drudgery of cavity preparation. Just as the general surgeon works for speed, as well as accuracy and skill in his technical procedures, to minimize the physical shock to the system, we as dentists should continue to make every effort to lessen the mental shock to the patient. It might appear that these thoughts are unduly solicitous and sympathetic, yet all of us, I am sure, when we sit in the dental chair, appreciate painless cavity preparation and as brief a session with the drill as is possible. It is stated in Hippocrates' oath that those enlisted in the healing arts should make every human effort to eliminate pain and suffering, and we as dentists would do well to continue our efforts to follow these precepts by shortening the dreaded drilling period.

Overcoming Possible Difficulties from Use of Air

One might feel that a continuous blast of compressed air on an open cavity would elicit severe pain. This is the usual experience with a chip blower; but the dentin, it has been found, can adjust itself to change brought about gradually. With the air-flow handpiece, a much lower pressure, 3 to 5 pounds, is employed than with the chip blower and

the stream can be gradually introduced. Moreover, the friction heat absorbed by the air seems to keep the stream within the thermal tolerance zone of vital dentin.

Occasionally, and it is rare, during excavation of a deep cavity, the patient may complain of pain. In such cases, the patient can be instructed to press the valve intermittently and just sufficiently to dispel the débris. We instruct him to press the valve gently every fifth count.

Relative to possible noxious effects from desiccation of the pulp, the following can be reported. A perusal of all available literature on thermal control, and contact with current research workers in the field, reveal only one man who has made histologic sections of teeth that have been excavated under compressed air-flow. His writings on the subject will be published in the near future. In the meantime, his present work, he states, convinces him that there are no harmful effects on the pulpal structures from preparing cavities with a constant air-flow. We await his complete report with interest.

While operating the air flow with the air gun, the patient can vary the pressure with instructions from the operator. If the air valve is opened very wide, the offensive odor of decayed tooth structure may become objectionable to both patient and dentist. A transparent face-shield which can be quickly fitted on the eye glasses may be employed to obviate this condition (Fig. 4), or, if a strong flow is desired, the patient can be instructed to moderate the air flow just enough to eliminate débris. This shield, incidentally, offers protection for both patient and dentist against the transmission of colds and exposure to an offensive breath. It is much more comfortable than the ordinary gauze mask. A similar celluloid shield is available for those who do not wear glasses.

At first, the operator experiences some awkwardness in manipulating the air-conditioned handpiece, just as he might in using a different type of extracting forceps for the first time. Five or six days of use seems to dispel this ineptness, and one rapidly becomes adjusted to use of the additional attachments.

Air Vs. Water for Cavity Preparation

On occasion, Dr. Carpenter's device can be used for carrying a continuous warm water supply to the cavity. The use of water has definite limitations, but it is an excellent absorbent of heat and can be employed with advantage in preparations requiring the use of large disks and stones, in which greater friction heat is produced than with steel burs. Henschel recommends a flow of water 100 F. at the rate of 8 cc. per minute. Special attention must be given handpieces and contra-angles since water can raise havoc with their smooth operation. Steel burs cut better in a perfectly dry field. Although water is a better heat absorbent than air, adequate absorption and dissipation of the friction-heat can be obtained with air, which also has the advantage of clearer vision. It is unlikely that the temperature of the air will go below 85 F., which Henschel believes is the lowest temperature that dentin can tolerate without pain.

Conclusion

The simplest form of the air-conditioned instrument operated by patient control or by use of the solenoid valve will doubtless be improved. Dr. Carpenter's recent arrangement in which the air line is concealed in the operating arm enables us to foresee a definite future for air-conditioned operating. I have used it constantly for a year and a half and I feel that a reversion to operating without air is like a return to horse and buggy days. It is not difficult to visualize every modern operating unit equipped with a concealed air line, synchronized with the foot control, if

desired, and the metal tubing at the handpiece inserted in some way in the sheath. The advantages of clearer vision and more rapid as well as more accurate operating that this instrument affords make it a boon to the busy dentist and to his patient.

Summary

The advantages of operating with the air-conditioned handpiece are as follows:

1. The operative time is cut in half.
2. Excellent vision of the operative field is afforded.
3. There are no irksome interruptions for use of a chip blower or warm water irrigations.
4. Débris and saliva are blown from the cavity.
5. Oozing of blood is eliminated by air-flow, which seems to constrict the capillaries.
6. Pain due to friction heat is eliminated and the tooth is kept cool and dry.
7. No cotton rolls are necessary in cavity preparation.
8. The bur clogs less and cuts faster.
9. Pulp safety is increased.
10. The patient-control device distracts the attention of the patient from the operative procedure.
11. The mental strain of the patient is minimized by halving the drilling time.

Bibliography

1. Henschel, C. J.: Pain Control by Heat Control. D. Digest., 47:294, July 1941.
2. Henschel, C. J.: Heat Impact of Revolving Instruments on Vital Dentine Tubules. J. D. Res., 22:323, August 1943.
3. Puterbaugh, P. G.: Control of Pain in Dental Practice. Apollonian, 6:233, October 1931.
4. Carpenter, Victor: Air-Conditioned Handpiece. Harvard D. Alumni Bull., 1943.
5. Re Face Shield. Uhlemann Optical Co., Chicago, Ill.

Naval Training Center, Miami, Fla.

SIMPLE GOLD FOIL RESTORATIONS*

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It is to be deplored that, since the introduction of the cast gold inlay technic and the silicious cements, the use of cohesive gold foil has diminished. Cohesive gold foil as a filling material still occupies an important place in operative dentistry, for there is no other material that, when properly condensed and contoured, insures the permancy and durability of the result that gold foil does. From the standpoint of lasting qualities, gold is supreme. The word "permanent" is a relative term when applied to materials used in the oral cavity, but time has proved that gold foil meets the requirements better than any other material.

The indiscriminate use of gold foil, as of any other filling material, leads to failure. The principal objection to the use of gold foil is the patience required in learning to manipulate it properly. It is regrettable indeed to limit our service to patients by our inability to perform a gold foil operation or a tendency to select a more easily-handled substitute for the case at hand. This is especially true of the simple cavities that are small and not time consuming and do not require a difficult manipulative operation.

Nevertheless, even in simple cavities,

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there are basic conditions that influence the selection of the filling material. 1. The character and quality of the enamel must be considered, because of the mechanics involved in condensing and finishing gold foil. A hard, gnarled enamel supports gold foil and so is more desirable than a soft, easily cleaved enamel, which in action is supported by the gold foil. 2. Age is important, not as a chronologic factor, but as a factor in caries susceptibility. While gold foil is a durable filling material, it does not offer insurance against recurrence of decay nor does it inhibit decay and decalcification. 3. It is the obligation of the dentist to develop appreciation of fine dental work in his patient. It is an educational problem that must be presented during the patient-dentist relationship, with the ideal of preserving that relationship over an indeterminable number of years.

Fig. 1.—Releasing gingival margin to obtain access to cavity.

In addition to the basic conditions outlined above, there are practical considerations in evaluating the indications and contra-indications for gold foil fillings in simple cavities:

1. Access is of paramount importance to the dentist. No tooth should be ruthlessly operated on because of a whim of some operator that leads him to insert a gold foil filling when an amalgam or a silicate could be inserted with conservation of tooth structure.

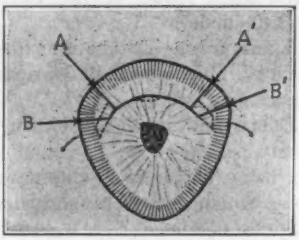

Fig. 3.—Retention form avoiding mesio-axial or disto-axial line angles.

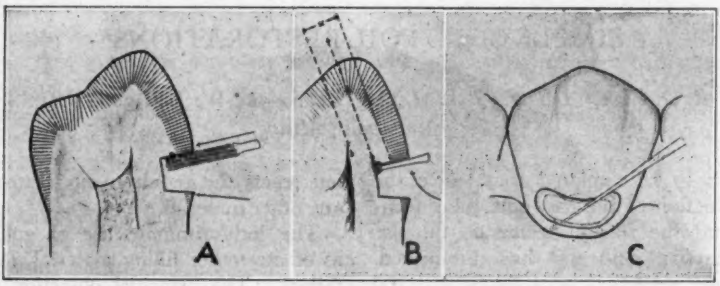

Fig. 2.—*A*, opening cavity with cross-cut fissure bur. *B*, creating resistance form with inverted cone bur. *C*, accentuating resistance form with small round bur.

2. When esthetics becomes a key factor in the patient-dentist relationship, consideration must be given to the fused porcelain inlay, the acrylic inlay and the synthetic cements.

3. From a biologic aspect, the tolerance of the supporting tissue of the

tooth, as well as the type and extent of the carious lesion, must be carefully evaluated before ruling out a gold foil restoration in preference to an amalgam or gold inlay restoration.

4. In the cases of attrition, abrasion, erosion, decalcification or senile decay, when the periodontal tissue has undergone a retrogressive change, one must be considerate of the remaining tissue.

5. In extensive carious lesions without a periodontal disturbance, the life of

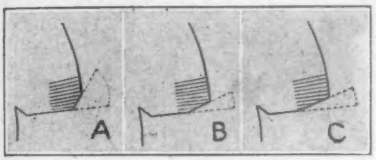

Fig. 4.—*A*, short bevel. *B*, long bevel. *C*, full bevel.

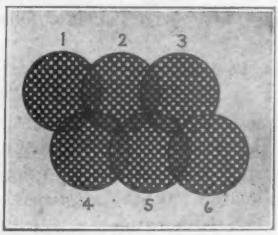

Fig. 5.—Movement of plugger point three-fourths its diameter after each blow.

the pulpal tissue must not be jeopardized by the mechanical trauma of condensation if one is to render good service with a perfect filling material.

In spite of these practical considerations and contraindications, a relatively large number of simple cavities exist wherein gold foil is the material par excellence. It is the purpose of this presentation to outline some of the procedures followed at the University of Minnesota in preserving these surfaces with gold foil.

To illustrate the value of gold foil fillings, let us consider its use first in only the simple gingival surface cavities—the so-called Class V cavities.

Preparation is given a twofold meaning: (1) the preparation of the patient and (2) the preparation of the cavity. There is no denying that many patients prefer operations that are not prolonged and nerve taxing. In preparing such a patient for a gold foil restoration, a local anesthetic is the first step toward a considerate operation for both the patient and the operator. There are patients in whom nervous apprehension can be reduced by premedication with drugs of the barbital series. Occasionally, nitrous oxide analgesia or topical

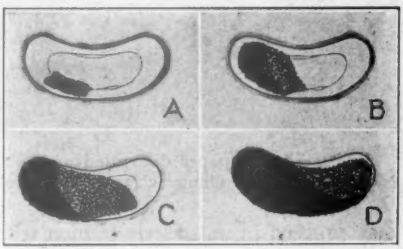

Fig. 6.—*A*, starting foil in distogingival retention form. *B*, filling opposite retention form. *C*, wedging gold between walls of cavity. *D*, building gold out to contour along gingival portion of cavity and toward mesial portion.

anesthesia will make the procedure easier for both the patient and the operator. Certain patients will tolerate the whole operation without any anesthetic at all.

If an anesthetic is to be used, a local is preferred because it desensitizes not only the pulpal tissue of the tooth, but also the tissue that is to support the rubber dam and possibly cervical clamps. Likewise, it is not considered irrational to release the free gingival margin surgically as illustrated in Figure 1 when such tissue obstructs the field of operation.

The actual preparation of the cavity is based on a knowledge of tooth anatomy and morphology. The dental armamentarium should be placed on the operating table so that the operator

Fig. 7.—*A*, foil tacked on with excess over margin. *B*, plugger point moved progressively to margin. *C*, excess foil folded back onto filling. *D*, excess tacked. *E*, plugger point moved progressively over margin.

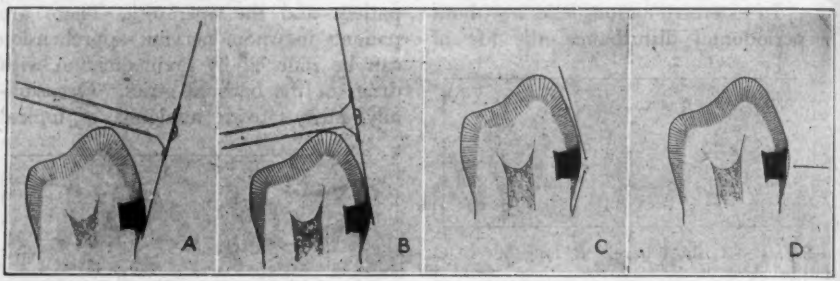

Fig. 8.—*A*, sandpaper disk tilted to finish gingival portion of filling. *B*, disk tilted to finish occlusal portion of filling. *C*, properly contoured filling. *D*, improperly contoured filling.

may proceed in an orderly fashion with a minimum amount of time and motion lost. In opening a cavity where it is not possible to cut away unsupported enamel with chisels, the bur of choice is a small cross-cut fissure. This bur is selected because it can be used as a guide to the enamel cleavage lines when held at right angles to the surface of the tooth.

For example, in Figure 2 *A*, a longitudinal section of a lower first bicuspid is being opened with a cross-cut fissure bur. The direction of the enamel rods in this buccal surface suggests the possibility of undermining these rods by the use of an inverted cone bur. The resistance form in this cavity is made with a 33½ inverted cone bur. The retention forms should be placed in dentin, one-half the distance between the dentino-enamel junction and the pulpal tissue, as illustrated in Figure 2 *B*.

Likewise, the number of retention forms is determined by the over-all mesiodistal length of the cavity. In small cavities, two retention forms will suffice as long as they are opposite in the occluso-axial line angle and the gingivo-axial line angle. In ordinary cavities in bicuspid teeth, three retention forms are indicated. One is placed in the occluso-axial line angle, as illustrated in Figure 2 *C*. Figure 2 *C* also illustrates how these retention forms can be accentuated with a 000 round bur. This can also be done with a right-angle hatchet or mon-angle hoe, and this accentuation is regarded as a convenient form for the starting of the filling. Large Class V cavities require four retention forms. Two are placed in the occluso-axial line angle and an opposing pair are placed in the gingivo-axial line angle.

Retention forms are not placed in the mesio-axial or disto-axial line angles for two reasons: 1. There is the possibility of weakening the mesial and distal enamel plates in this region because of the circular geometric outline of the tooth in this area. Figure 3 illustrates

this consideration, and it should be obvious that if the mesial and distal enamel plates were undermined in areas *AB* and *A'B'*, they would become friable. Undermined enamel does not afford a retention form. 2. If, at a later period, the mesial or distal surface of this tooth containing a buccal gold foil with retention forms in the mesio-axial or disto-

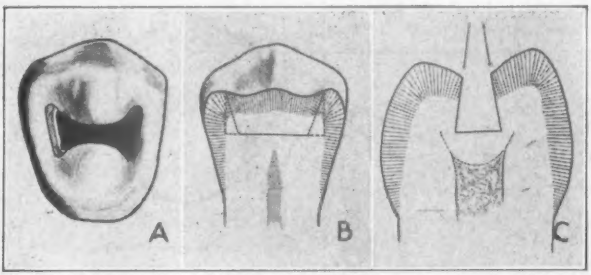

Fig. 9.—*A*, occlusal cavity outline form. *B*, marginal ridges not undermined. *C*, resistance form of the occlusal cavity.

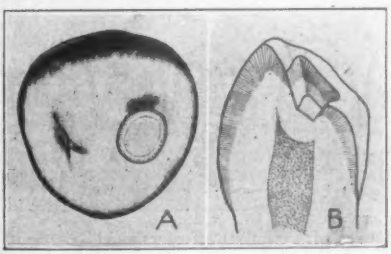

Fig. 10.—*A*, cavity outline form in lower first bicuspid. *B*, pulpal wall inclined toward buccal aspect.

axial line angle should become carious, it is probable that, in preparing the mesioclusal or distoclusal cavity out to *A* or *A'*, one of the retention forms in the gold foil would be severed and the filling would be weakened if it did not actually work loose.

The cavity is finished by placing a long bevel on the cavosurface angle. In describing a bevel, we have chosen a nomenclature that is arbitrary and is described best by the illustrations that are shown in Figure 4, *A*, *B* and *C*.

Figure 4 *A* is indicated as a short bevel of enamel bearing 45 degrees or more from the pulpal wall. This bevel is avoided in this cavity because it produces a thin feathery edge of gold foil. Figure 4 *B* is a "long" bevel of enamel bearing less than 45 degrees or more from the pulpal wall. It is the type

Fig. 11.—Longitudinal section of lateral incisor in which lingual cavity has been prepared.

desired in buccal cavity preparation because it produces a sharp line of demarcation between the filling and the enamel by virtue of the fact that it approximates a butt joint seam. Figure 4 *C* is spoken of as a long bevel because

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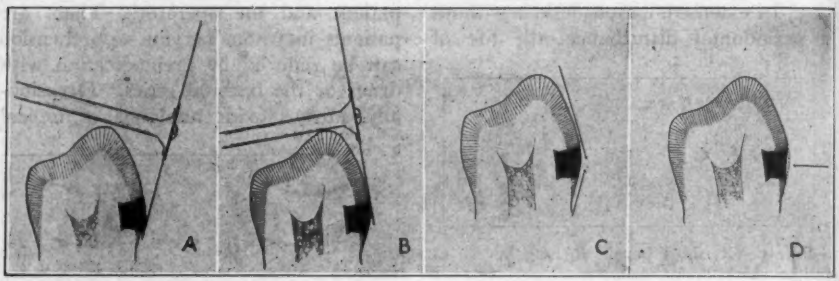

Fig. 8.—*A*, sandpaper disk tilted to finish gingival portion of filling. *B*, disk tilted to finish occlusal portion of filling. *C*, properly contoured filling. *D*, improperly contoured filling.

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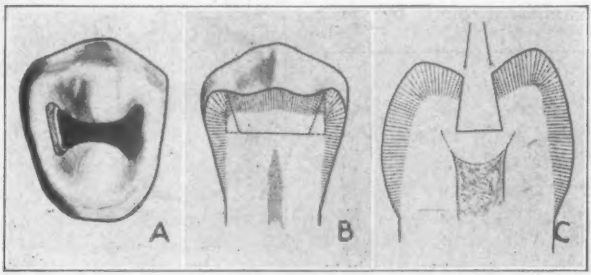

Fig. 9.—*A*, occlusal cavity outline form. *B*, marginal ridges not undermined. *C*, resistance form of the occlusal cavity.

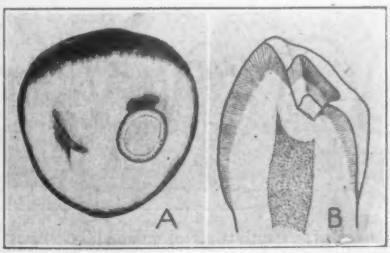

Fig. 10.—*A*, cavity outline form in lower first bicuspid. *B*, pulpal wall inclined toward buccal aspect.

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Fig. 11.—Longitudinal section of lateral incisor in which lingual cavity has been prepared.

desired in buccal cavity preparation because it produces a sharp line of demarcation between the filling and the enamel by virtue of the fact that it approximates a butt joint seam. Figure 4 *C* is spoken of as a long bevel because

it extends from the dentin through the enamel and is used in various other types of cavity preparation.

Gold foil, to be easily manipulated and perfectly condensed, must be properly annealed. Too little heat will not anneal gold foil sufficiently to bring out its full cohesive properties, and too much heat is apt to fuse the fine edges and render the gold harsh and hard. Gold foil may be annealed piece by piece in an alcohol flame or in bulk by being placed on a porcelain plate over a gas burner or an electric heating element. The electric annealer is the most scientific means of annealing gold foil.

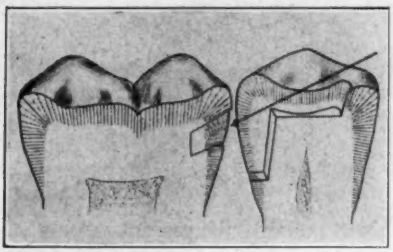

Fig. 12.—"Spot" filling.

In condensing the foil, there is a tendency to use too large plugger points in order to save time. After the retention forms are filled, a round or square plugger point with a 1-mm. face can be used for the remainder of the condensing of the gold foil in the entire cavity. This eliminates varying the force of the condenser inversely to the square of the area of the plugger point.

Likewise, the selection of too large a pellet or foil, while apparently saving of time, requires more skill in manipulation in order to get proper condensation. The No. $\frac{1}{2}$ or $\frac{3}{4}$ size foil pellet is recommended.

The successful operator follows a definite system of stepping the plugger point, from the center of the mass toward a wall, moving the point only a distance of three-fourths of the diameter of its face after each blow, as illustrated in Figure 5. By this technic, the blows overlap each other, shingling the gold foil to place and avoiding bridging and imperfectly condensed layers.

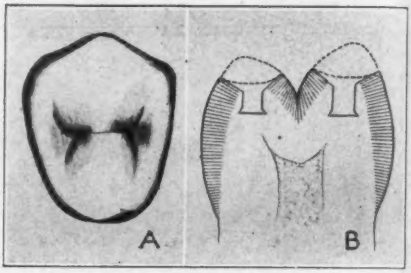

Fig. 14.—*A*, attrition of upper bicuspid. *B*, longitudinal section of same tooth in which gold foil cavities have been prepared.

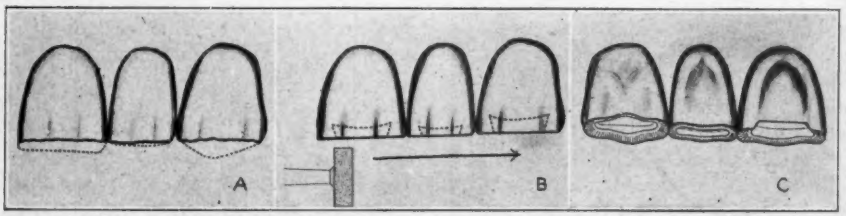

Fig. 13.—*A*, attrition of incisal surface. *B*, removal of irregularities of enamel. *C*, cavity preparation for incisal gold foil restoration.

In starting gold foil in a simple cavity, it is proper to start in the retention area distally from the operator and to continue in this direction until the bulk of condensed foil approaches the opposite retention form. After the two opposing retention forms are filled, the gold is

wedged to place between the walls of the cavity and built out to contour as well as forward to the mesial portion of the cavity. These steps are illustrated in Figure 6, *A, B, C* and *D*.

The condensing of the foil at margins is very difficult unless some definite technic is followed. One of these technics is to step the plugger point from the center of the mass toward the margin without actually striking the margin. Any excess of uncondensed foil lying over the margin can be folded back, and the same process of condensing toward the margin can be repeated as illustrated in Figure 7, *A, B, C, D, E*.

By following this technic, a perfectly condensed seal is made between the tooth structure and the filling without the danger of pulverizing the enamel margin.

After condensation, the foil is burnished and the excess is removed with trimming knives, files, tapering stones and tapering single-cut fissure burs. With reasonable care, the majority of the buccal or labial cavities can be finished with a sandpaper disk reversed in a contra-angle. By tilting the disk, as illustrated in Figure 8 *A* and *B*, loss of contour is avoided. Figure 8 *C* shows a properly contoured filling, which restores the physiologic function of the height of convexity on a normal tooth and protects the gingival tissue by deflection of foods in the masticatory process. Care should be taken in using a disk not to polish away the height of convexity of the filling, as illustrated in Figure 8 *D*. Loss of contour hastens gingival recession and causes exposure of the cementum gingivally from the filling. Rouge disks may be used for polishing, as well as the rubber cup conveying pumice and whiting.

Another practical application of gold foil can be made in the occlusal surfaces of the upper and lower bicuspids. The occlusal surfaces of the upper first and second bicuspids and the lower second

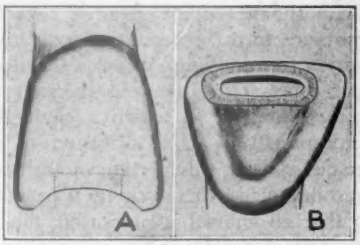

Fig. 15.—*A*, labial aspect of incisal cavity prepared in hypoplastic central incisor. *B*, incisal aspect of same cavity.

bicuspids have many small fissures which can be opened when carious and filled with gold foil. The structure of these teeth necessitates a special consideration of cavity preparation. For example, in preparing a cavity in an upper first bicuspid for foil, it is not necessary to extend the occlusal surface of the cavity high onto the buccal and lingual triangular ridges. Nevertheless, the cavity should be extended through the central groove. In Figure 9 *A*, between the buccal triangular ridge and the lingual triangular ridge, the occlusal surface of the cavity is not wide, but the cavity has been extended into the mesiobuccal, mesiolingual, distobuccal and distolingual triangular grooves. This extension can be obtained by using a 700 or 701 tapering cross-cut fissure bur. Caution must be observed not to undermine the mesial and distal marginal ridges. (Fig. 9 *B*.) The gold foil restoration having this cavity outline has been referred to as the "ribbon foil" because it extends through all the grooves and still is not a bulky restoration.

If the cavity is extended as far as is indicated by the dotted lines in Figure 9 *B*, it will not only be difficult to fill in the mesial half, but also all the support to the marginal ridges will have been removed and they will become friable to condensation and masticatory stress. Through the central groove, this

cavity should be so prepared that the resistance form becomes decidedly a retention form. Figure 9 *C* is a longitudinal section of a bicuspid through the transverse ridge in which a cavity has been prepared. The direction of the enamel rods in this portion of the tooth is to be noted. If the cavity is prepared so that all enamel is supported, the net result is obviously a retentive resistance form. Convenient starting retention in Figure 10 *A*. Attention must be given in preparing these pit cavities, since the pulpal wall should slant lingually in order not to expose the pulp, as shown in Figure 10 *B*. Also, the direction of the enamel rods on the occlusal surface must be studied, so as not to undermine any enamel.

An occlusal foil filling can be finished with stones, sandpaper disks and finishing burs. Because the fillings are narrow

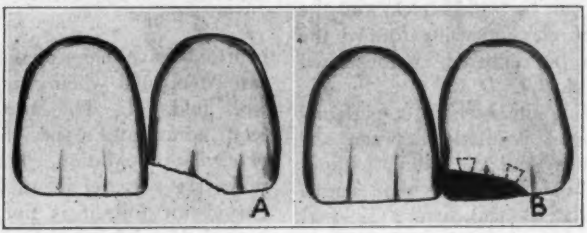

Fig. 16.—*A*, chipped central incisor. *B*, same tooth filled with gold foil.

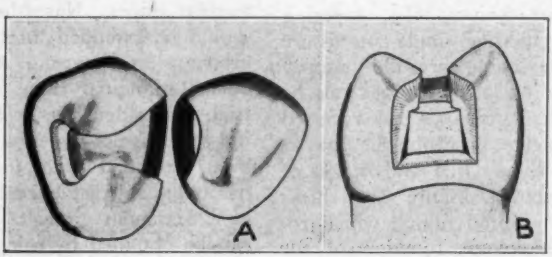

Fig. 17.—*A*, occlusal aspect of mesioclusal cavity for gold foil in upper first bicuspid. *B*, proximal aspect of same cavity.

forms may be placed under the cusps or on the floor of the cavity in any area where they do not embarrass the pulp.

Again access cannot be disregarded where one is inserting an occlusal foil in posterior teeth. In some cases, if the lips are narrow or the bite impeded, it may be necessary to prepare the cavity primarily for access.

In the lower first bicuspid, which has a well developed transverse ridge, the cavity outline is different from that for other bicuspids. Usually, caries occurs in the mesial or distal pits, as illustrated buccolingually, no attempt is made to carve deeply for anatomic form, although a sulcus is simulated by the use of a round finishing bur.

The lingual cavities of the upper anterior incisors can be filled with gold foil in the majority of instances. Occasionally, one sees a cavity of this type that has been filled with amalgam; and, in some instances, the tooth is discolored. Gold foil is an ideal filling material for this type of cavity in anterior teeth.

Figure 11 shows a longitudinal section of an upper lateral incisor illustrating

the consideration that must be given to the enamel rods and the direction of cutting in dentin to avoid exposure of the pulp. These cavities are deceiving in that, quite often, they are deeper than one would expect. If the cavity is prepared in the direction indicated in Figure 11 by the dotted line, exposure of the pulp may occur.

If there is any question regarding the depth of the cavity, it is always advisable to insert a cement base.

Another practical use for gold foil is spot fillings in the mesial surfaces of posterior teeth to which access can be had through the distoclusal area of the adjacent tooth (Fig. 12) or, as in young persons, where the adjacent tooth has not erupted. The extent of the carious lesion, as well as access, is to be considered before this type of filling is inserted.

In cases of attrition, wherein the incisal surfaces and the occlusal surfaces have been worn down to a point at which the dentin is exposed and sensitive, gold foil can be applied in a practical manner. The question that arises in these cases is whether to simply protect the dentin or to restore the enamel lost by attrition. One cannot restore the enamel lost to one tooth in a mouth and not restore and balance the occlusion of the other teeth. Attempts to restore the enamel lost to one tooth result in traumatic occlusion and, ultimately, failure. Figure 13 *A* shows three anterior teeth that have been worn down by the amount indicated with a dotted line. If one wishes to arrest the attrition process, it is necessary to protect these incisal surfaces. Before starting the cavity preparation, the incisal surface should be stoned down to a flat surface, all irregularities in the enamel being eliminated as illustrated in Figure 13 *B*.

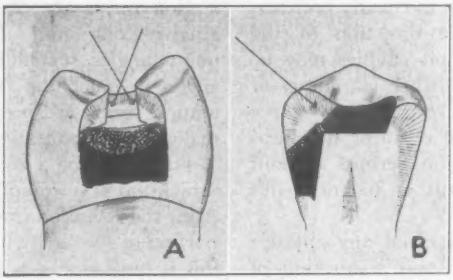

Fig. 18.—*A*, filling proximal portion of mesioclusal cavity in first bicuspid. *B*, filling occlusal portion of same cavity.

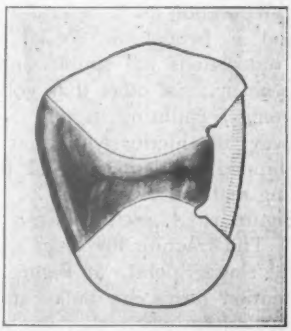

Fig. 19.—Proximal gold foil cavity in upper bicuspid in which distoclusal inlay had been placed previously.

Figure 13 *C* shows the cavity preparation for these teeth. If the teeth are narrow labiolingually, it is necessary to remove more of the lingual enamel plate than the labial enamel plate so that the cavity can be prepared, and to assure

that all enamel is supported by dentin.

In cases of attrition in the posterior teeth, the same consideration must be given to the balance of occlusion as is given in anterior teeth. Figure 14 *A* shows the occlusal aspect of an upper first bicuspid in which the cusps have been worn away. The dentin, because it is softer than the enamel, is usually cupped out in the center of the abraded area, this illustrating the consideration that must be given to the cavity preparation because of the direction of the enamel rods. The pit cavities may be filled to prevent further abrading of the occlusal surface, or they may serve as the foundation for restoring the cusps provided the occlusion permits without placing the tooth out of balance with the rest of the teeth.

If the incisal surface of any anterior tooth is hypoplastic and restoration of the normal contour of the tooth is desired, gold foil is the material of choice.

Figure 15 *A* and *B* show the finished cavity preparation in a central incisor that had a hypoplastic incisal edge. These restorations are simple and yet there is no material other than gold foil that promises enduring success.

Likewise, in anterior teeth that have been chipped accidentally, gold foil is the filling material of choice.

In Figure 16 *A*, such a case is illustrated. The fracture line does not involve the contact point. In Figure 16 *B*, the retention forms are bulky and yet not in a position where they might embarrass the mesial pulp horn.

Gold foil can be used in small mesioclusal cavities in upper first bicuspids where access is facilitated by previously preparing the cavity on the distal aspect of the adjacent cuspid. Many operators shy at this operation, when, in reality, it is a simple one because of the access through the distal cavity on the cuspid. Figure 17 *A* illustrates this condition, showing the cavity preparation in the bicuspid. The occlusal portion is prepared in the same manner as the simple occlusal cavity for gold foil. The advantage of gold foil over a gold inlay in this cavity is that the cavity does not have to be extended so far buccally in the proximal portion of the cavity. Figure 17 *B* shows the proximal aspect of the mesioclusal cavity in the bicuspid. The buccal and lingual axial walls converge slightly toward the occlusal, giving resistance form to the cavity. The retention forms are placed in the buccogingivo-axial and linguogingivo-axial point angles, extending into the line angles in much the same manner as retention forms are prepared for a proximal gold foil restoration.

The filling of a mesioclusal cavity in a bicuspid is accomplished in two steps. After the retention forms in the proximal portion of the cavity have been filled, the foil is built up at a 45 degree angle to the pulpal wall, wedged between the buccal and lingual-axial walls and built out to contour from the gingival seat toward the occlusal aspect. (Fig. 18 *A*.) The second step consists of filling the distal half of the occlusal portion to contour and also at an angle of 45 degrees to the pulpal wall until it overlaps the proximal portion of the cavity. (Fig. 18 *B*.) The foil is carried in this same direction, and the marginal ridge is restored to contour. The filling is finished with strips, disk, stones, trimming knives and finishing burs as has been described.

Occasionally, one finds a mesial cavity in a bicuspid in which a distoclusal inlay had been placed. The question arises as to the type of restoration to be made. The inlay can be removed and a mesioclusodistal inlay constructed, or a mesioclusal inlay can be interlocked with the distoclusal inlay. Gold foil can be used in this case provided there is access. Figure 19 shows the occlusal aspect of the cavity preparation for this type of restoration.

The retention forms are placed in the

point angles illustrated in Figure 18 *B*.

The purpose of this presentation of simple and practical uses of gold foil has been to demonstrate that, with full recognition of the exceptions, there still remains a place for its use and to discard it completely because of its manipulative exactions is to ignore our responsibility in the matter of service to our patients.

ALGINATE IMPRESSION MATERIALS

Luzerne G. Jordan, D.D.S., Washington, D. C.

Alginate impression materials offer many advantages over hydrocolloid. Like other materials, the alginates require special manipulation and treatment for maximum results.

Some of the difficulties encountered in its use may be attributed to the fact that these materials are relatively new, and the details of technical procedure have not been worked out. I have found the following information valuable in the use of these materials.

Temperature Control

The temperature of the water with which the alginate material is to be mixed governs the setting time and is therefore checked with a thermometer. A few degrees difference may mean a different setting time.

The operator should determine the temperature that will assure the desired working time with the material of his choice. In some cases, this may differ several degrees from that recommended by the manufacturer, and it may also vary at different seasons of the year. I use colder water in summer than in winter.

Impression Trays

Perforated trays should not be used with the alginates because they do not properly confine or trap the material and thus do not force it into intimate contact with the teeth and tissues. The alginates, unlike the thermal-setting agar hydrocolloids, set in a manner similar to that of plaster, and thus, when inserted in the mouth, are sufficiently soft to escape easily through the tray perforations. With the agar hydrocolloid materials, the effect of a solid wall tray is obtained with a perforated tray by chilling the tray side before seating in the mouth.

I use regular solid wall or orthodontia type trays, obtaining a locking of the material to the surface of the tray by coating its inner surface with a thin layer of beeswax. Short staple cotton is pressed against the beeswax surface and the excess is pulled away leaving cotton fibers attached to the wax. This assures ample retention. If modeling compound is used instead of beeswax, the surface may be moistened with acetone and cotton applied while the surface is sticky.

Postdamming of the tray or additions to the palate of upper trays or in edentulous areas can be made with either beeswax or modeling compound, to which the cotton fibers are then attached.

The Impression

The small bubbles that sometimes appear on the surface of the cast are the result of trapping of saliva and air, which causes surface defects. They may be minimized by having the patient rinse the mouth with warm water while the alginate material is being mixed. Before

the filled impression tray is placed in the mouth, a strong blast of compressed air is directed on the teeth and tissues and, with the finger as a spatula, some of the excess material is quickly wiped against the buccal, labial and lingual surfaces of the teeth and on the occlusal rest areas of the abutment teeth. The tray is carried to place immediately. Care should be used to avoid movement of the tray after it has been seated and while the material is setting.

Pouring the Cast

The impression should be filled within a few minutes after removal from the mouth, except, of course, when it requires fixing in a special bath.

The alginates are comparatively flexible, and this is a good feature, but care must be taken not to distort the impression while filling it with cast material. It should not be filled, inverted and forced into more material.

It is better to fill the impression with a stiff mix of artificial stone, being sure to cover all areas desired on the cast and keeping the filled impression upright until the stone has completely set. Sufficient material should be used to provide ample strength, especially in lower casts, which will be horseshoe shaped at this stage.

When thoroughly set, the partial stone cast is carefully removed from the impression, soaked in water and seated on a new mix of stone to complete the base portion of the cast and the tongue space of the lower cast. This procedure avoids distortion of the impression and results in a much neater cast.

1801 Eye Street, N. W.

STAINLESS STEEL IN ORTHODONTICS

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The virtues of stainless steel and its application to orthodontic use have long been known. It is only recently that refinements in technic in soldering and cleaning or "pickling" have made possible its use in a more generalized way. Today, manufacturers make contoured molar and anterior bands in numerous sizes and ready for immediate use. They also manufacture tubes, sheaths and brackets to accommodate different types of appliances. Both dead soft wire for ligature use and hard tempered for arch wires, coil springs, etc., are made in all gages varying between 0.003 and 0.102 inch. Band material varies from 0.002 by 0.094 inch to 0.008 by 0.250 inch. It is essential for one who wishes to adopt a steel technic to include in his armamentarium a spot-welding machine, which is inexpensive and can be put to various uses. It is unnecessary to stock up on manufactured attachments that may be put to occasional use only. Simple methods for making attachments to suit one's own special technic are herewith described. (Figs. 1 and 2.)

In constructing molar bands, chrome steel 0.006 by 0.200 inch should be used. These can be made by either the direct or the indirect method.

Molar Bands

Indirect.—The work is done on a stone model and approximal contacting surfaces of adjacent teeth are cut away. After a copper band measurement of the widest portion of the tooth is taken, a strip of band metal a trifle larger is cut off, the excess being marked off with a scratch for the lap joint. This is welded three or four times on the machine and

the band contoured in the usual way on the stone model.

Direct.—A copper band measurement is taken and the band slipped on any gage commonly used. Time is saved by making up a supply of different sized steel bands, ready for use. A band a half size smaller than the measurement is selected from stock. Steel stretches readily. The band is contoured and stretched slightly at the same time on the band stretcher. The band is brought to the mouth for further contouring and trimming. At this point, it is often necessary to slit the band near the occlusal aspect at one or two places, recontour and weld at the joints. Again, the band is carried back to the tooth for final contouring. It is advisable to note that stainless steel gets tougher with handling, so that the band, by the time it is shaped and finished, is thoroughly tempered.

The fully prepared band is now ready for an attachment. Soldering of a precious metal tube is shown in Figure 2. If steel is to be used, a tube is pressed out with the end of flat-nose pliers to fit the gage to be used for the arch wire. (Fig. 3.) The tube is welded at one spot only and carried back to the mouth. By the adjustment of a piece of arch wire up or down, the tube can be properly positioned on the band. The band is removed and welding of the tube completed at various places to secure it well. Where intermaxillary elastics are to be used, it is preferable to solder on a precious metal tube, leaving a space distally to accommodate the elastic.

Fig. 1.—Spot welding machine. *A*, nut holding electrode *A'*. The parts to be welded are placed between electrodes *A* and *B*. *C* adjusts the stage between *A'* and *B* for the proper placement of the article to be welded. This can be either hand or foot pedal controlled. *D* controls spring pressure. *E* regulates the current, which should be at the lowest control point for welding all band material and attachments.

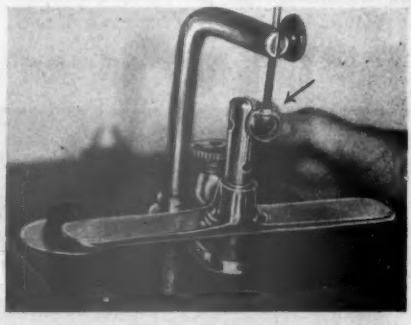

Fig. 2.—Tube being soldered to band (arrow). The lower electrode is a carbon for spot soldering. There is a glow from under the band when the current is applied. With a little sticky wax, the tube is placed in position and checked in the mouth. One touch of the switch melts away the wax. A bit of flux is applied and soldered and again the switch is tapped and soldering completed. The heat comes from below, oxidizing only the point where the tube is soldered to the band. This method is also employed for soldering precious metal brackets to steel band material.

Anterior Bands

For anterior bands, 0.003 by 0.125 or 0.003 by 0.150 inch are used. Any type of band-forming pliers may be utilized. A Howe plier is quite suitable for this purpose. If a bracket is to be affixed, it is advisable to have it attached before pinching the band in the mouth. It is not necessary to pinch the band too tightly

when fitting and contouring as the slack will be taken up later. (Step B, Fig. 4.) The same technic may be carried out in the construction of molar bands. It is essential to clean all bands and arch wires in a pickling solution before cementing them to place. This will prevent decalcification of tooth material under the welded and soldered joints, which become oxidized in processing. For this purpose, a solution of orthophosphoric acid, consisting of 3 parts phosphoric acid, 1 part glycerin and 1 part water, is used. It is best to clean this electrolytically (Fig. 6) in order to avoid the objectional odor that will otherwise be found when boiling the solution in a porcelain acid dish.

Owing to the strength and springiness of steel, a gage wire lighter than would

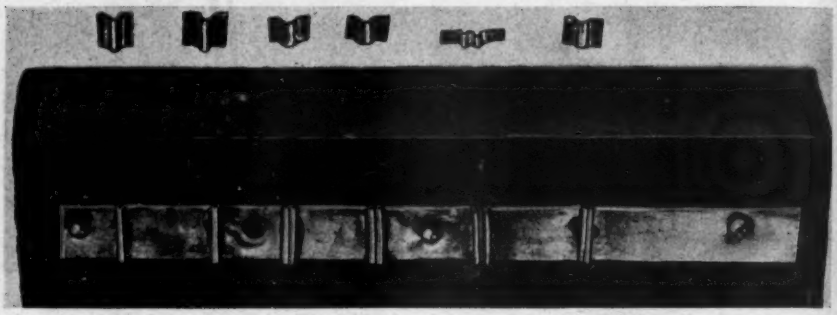

Fig. 3.—Jig made from hard wood block. The strip nailed down is 0.008 by 0.250 inch band material, to which is soldered arch wire of various gages. Above can be seen attachments that have been pressed out: *A*, 0.031 inch; *B*, 0.036 inch; *C*, *D*, 0.025 inch and 0.036 inch double for making lingual sheaths in Atkinson lingual bar. *E*, 0.008 inch doubled over and soldered. By placing 0.031 inch wire over a strip of 0.006 inch material and pressing it into the trough in the middle and contouring with a flat-nose pliers on both sides, a perfect tie bracket is assured. *F*, 0.031 inch double.

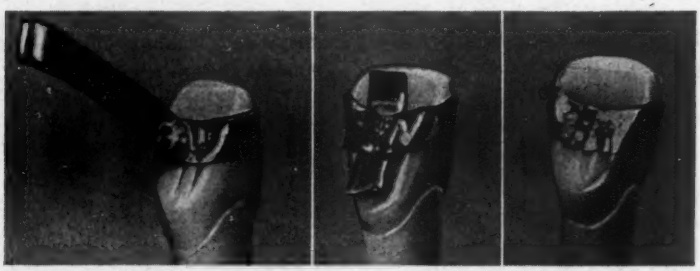

Fig. 4.—Band construction. *A*, first welds, which do not have to be close to the joint. *B*, small piece of band material slipped under joint and welded to band on both sides of original pinch. The excess is cut off and the band trimmed flush. This will conform perfectly to the tooth form. *C*, staple placed in the middle of lingual aspect of band so that rotations may be effected either mesially or distally. It is advisable to apply a staple routinely.

be employed in a precious metal technic is selected. There is no advantage in welding auxiliary springs. In fact, soldering is more practical and adaptable. There are a few important things to remember in soldering steel:

1. *Flux.*—Flux is applied freely to both ends of the wires to be soldered. There are many fluxes on the market, an excellent one having the following formula: potassium bismuth fluoride, 1 part; sodium borate, ½ part. This is macerated to a smooth paste once every hour for three hours and kept in a covered jar except when in use.

These ingredients are inexpensive and the flux can easily be prepared by a pharmacist.

2. *Solder.*—It is more convenient to utilize solder in wire form about 28 gage. Silver solder will flow more readily. A little is applied to each end of the wires to be soldered and then flamed. The reason for this is that the union is physical rather than chemical, as is the case in a gold technic.

3. *Flame.*—The wires are held directly outside of the flame in order to avoid overheating and oxidation. This is important.

4. Any of the temper lost by accidental overheating can be restored by holding one wire with the one hand and turning the pliers half way around in a clockwise direction with the other hand. (Fig. 7.)

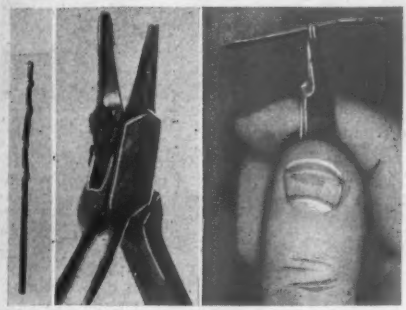

Fig. 5.—Flat nose pliers grooved on one side. A piece of 0.025 inch wire is welded to the other beak. This makes a perfect instrument for pressing out staples. Strips of 0.006 inch band material are used.

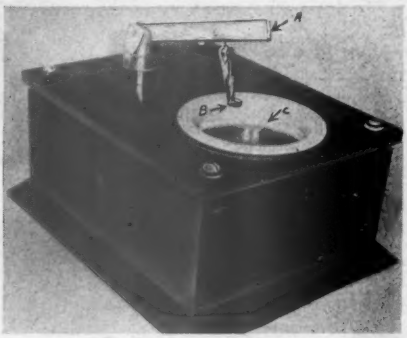

Fig. 6.—Electrolytic cleaner. *A*, upper electrode. *B*, band in clip ready for bath. *C*, orthophosphoric acid. Current is automatically cut off when rod *A* is up, and "on" when rod is down.

Coil Spring

Coil spring can readily be made in any gage, as shown in Figure 8. A hard tempered 0.010 wire is placed in the chuck together with the end of a foot length of the desired gage arch wire that the coil is to be wrapped around. The fingers are protected with a workmen's glove in guiding the coil around the wire. When the length has been fully wound, the motor is shut off.

Conclusion

Stainless steel is an excellent material for use in orthodontics. It is tougher and stronger than gold. Owing to its springiness, lighter gages can be used than in precious metal. The material comes highly polished from the mill and ready for use. If a welding technic is employed, no polishing is necessary. This in itself is a time saver. As there is little chance of food detritus sticking to the highly polished surface, the bands

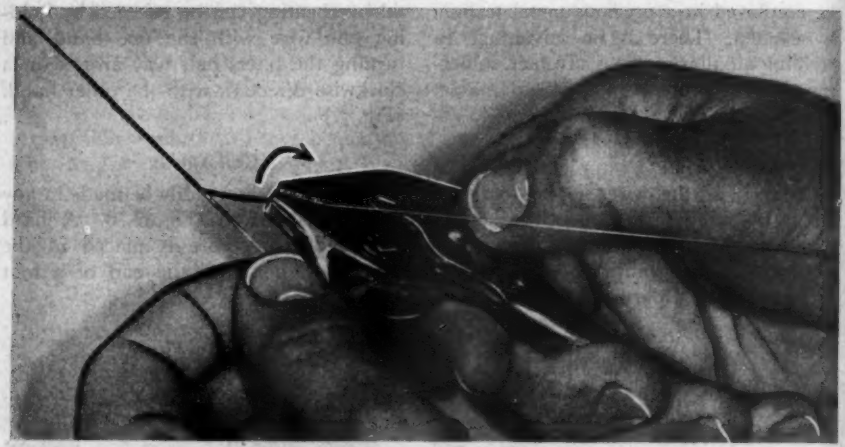

Fig. 7.—Restoring lost temper to wire.

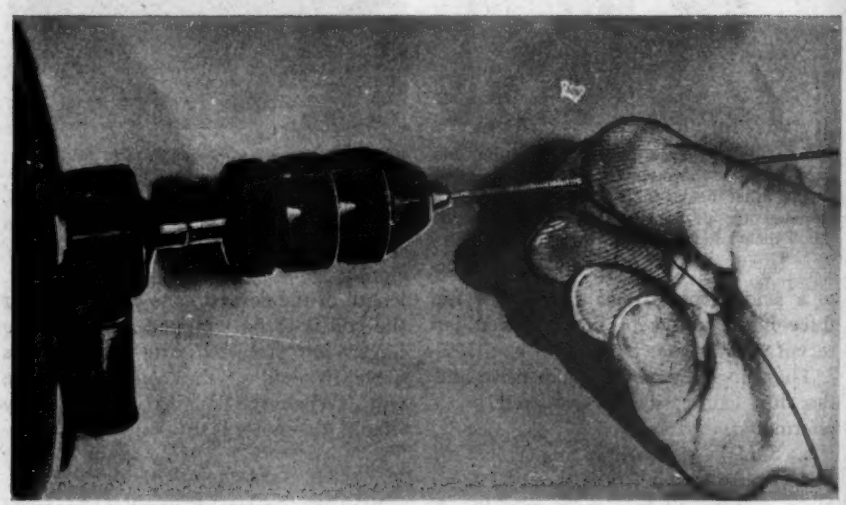

Fig. 8.—Wrapping coil spring.

will look well and remain clean at all times.

Last, but not least, the relative cost of steel and gold may be taken into consideration.

262 Central Park West.

DENTAL PROBLEMS IN POSTWAR PLANNING*

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The problem of providing dental health care for the American people is complex. It is further complicated by the variety of interpretations given to the component parts of the problem. Some plans, programs and opinions have appeared in the literature, while others have been discussed at public forums. All of these have brought about debate, misunderstanding, misconstruction, misapprehension and fears, which have often led to emotionalism and clouded vision.

We all agree that dental health for the American people is the goal of American dentistry, but we, as yet, cannot agree on a *modus operandi* for attaining that goal. It is hoped that dentistry will apply all of its energies to the solution of this socio-economic problem, just as it has done to many of the problems associated with the treatment of oral diseases.

I am not endowed with the powers of crystal gazing or forecasting the future. Therefore, it is my purpose to bring to you for consideration some of the elements involved in this problem of dental care and to suggest procedures that should be set up and tried. The experience and knowledge thus gained can be made available to the population as a whole and may solve in part the definite problem of prevention and control of dental disease. I shall present some of the data available as it pertains to personnel, needs and costs, though all of our knowledge, statistical and scientific, must be further studied and evaluated. We need more answers and we need more data to support these answers. Here it may be in place to say that statistics, a rather recent device in dentistry, when applied to data, must be carefully examined as to source and nature of study and comparisons made. The deductions and evaluations must be carefully weighed so that we will not get a partial solution or treatment of symptoms, but a sound diagnosis and a program planned for the cure, control and final prevention of dental disease as further knowledge and research make such steps advisable and possible.

The subject of manpower has been frequently discussed because of (1) the requirements of the military services, (2) distribution of dentists and (3) planning of dental services for the future.

For many years, it was assumed that the number of new graduates was insufficient to meet the losses in the profession due to death and retirement. The general picture was that we were running short about 750 dentists per year. This necessarily cut into the manpower available to serve not only the military needs, but also the civilian needs. In 1910, the estimated number of dentists in the United States was 39,997. In 1920, the estimated number of dentists in the United States was 56,152, a difference of 16,155. In 1940, the estimated number of dentists (A.D.A. estimate) was 71,000, a difference of 14,848.[1]

Note that in the years 1920 to 1940, we were not able to maintain manpower in dentistry. The number of new dentists between 1910 and 1920 was 16,155, and between 1920 and 1940, a span of twenty years, only 14,848. It must be remembered that of the total number of

*Read before the Valley District Dental Society, April 4, 1945.

1. Woodhouse, C. G.: Dental Careers. New York: Funk & Wagnalls Co., 1939.

dentists, the number not in active practice is indefinite. Men who have either retired or have entered other lines of endeavor maintain registration. Perhaps they are not active because of age, infirmities, full-time teaching positions, research or administrative and organizational activities. It must be noted, too, that the number of registered students in dental schools reached a peak in 1922 and a sharp decline followed through the years up to 1933. In 1922, there were 13,099 registered in the dental schools; in 1933, only 7,160. (Table 1.)

Table 1.—Total School Registrations

Year	Total	First Year	Second Year	Third Year	Fourth Year
32-33	7508				
33-34	7160				
34-35	7175				
35-36	7306				
36-37	7397				
37-38	7184				
38-39	7331				
39-40	7407				
40-41	7720	2305	1973	1841	1601
41-42	8355	2476	2070	1978	1831
42-43	8847	2702	2158	2041	1946
43	9014	2562	2463	2017	1972*

*Seventy female and ninety foreign included.

A large number of these registrants are older men in practice. Because of changes in the curriculum, as well as changes in the particular requirements since 1920, the average age of graduates is 25 to 26. In the class of 1940-1941, out of a total of 7,720 students, 2,090 have bachelor of science or bachelor of arts degrees; 223 had four years of college work; 112 had more than a college degree; a total of 2,425 students, which is equal to about 30 per cent of the total registration. If we add to these 1,338 students who had three years of college training prior to entering dental school, the total would be 3,763, or close to 50 per cent of the total student population having more than the required two-year predental scholastic requirement.

For the freshman class of the school year 1940-1941, the registration was 2,305. Of this number, 683 had at least four years of college work prior to entrance, or 29.6 per cent; 481 had more than three years of college, and only 1,141 the required two years. It can further be seen that the freshman class was reduced to 2,070 in the sophomore year, a loss of 235; and further reduced to 2,041 in the junior year, a loss of twenty-nine, and finally to 1,972 in the senior year. It is not clear which of the original 2,305 students finally finished the course.

The freshman class of 1941-1942 numbered 2,476. The same class lost 318 when it reached the sophomore year. The sophomore class of 1940-1941 was 1,973. When this class reached the junior year, its numerical strength was increased to 1,978, but on reaching the senior year, the number of students was reduced to 1,946. (Table 2.)

The figures for 1944 are as yet unavailable, so further comparisons cannot be made at this time.

Another interesting feature of the manpower situation is one of licensure.

The licensure report for 1939 shows that 2,744 took the state board examination and 2,173 were licensed, though 2,196 passed—a loss of about 21 per cent for the year. This too affects manpower.

While all of the foregoing facts are interesting, the most important one is that of distribution of manpower. Let us take the class of 1940-1941 again: out of a total of 7,720, 114 came from foreign countries.

If we include Massachusetts with 275, Michigan with 287 and New Jersey with 402 registered students, we have a total of 964 and a grand total of 4,462, which is 58.92 per cent of the total student body. (Table 3.)

A similar analysis of the student body for 1942-1943 and 1943 shows practically the same picture. (Table 4.) There is little change with New York, California, Illinois, Ohio and Pennsylvania accounting for 43 per cent and with the addition of Massachusetts, Michigan and New Jersey, 55 per cent. In 1943, the percentages were about the same.

Another interesting phase was the analysis of conditions in dentistry that came with the report of the Council on Dental Education in 1942, under the title of "Percentage of Failures in the State Boards for the Last Three Years, 1939, 1940, 1941." (Table 5.)

In eight states, the average of failures is above 40 per cent. A detailed report as to distribution of dentists was presented by J. T. O'Rourke in an article "An Analysis of the Number and Distribution of Active Dentists in the United States."[2] O'Rourke shows not only the uneven distribution of dentists as to population in the various districts in the United States, but also the uneven distribution as to population per square mile. It shows that the dental distribution is uneven in the South Atlantic, East South Central and West South Central districts and in the Mountain area. Among the reasons for this maldistribution, we may cite regional concentration of educational facilities, postgraduate and hospital training facilities, social as well as financial opportunities in communities and better per capita income level of a community. O'Rourke says that there is a close correlation between per capita income of a state or geographic district and number of dentists. The number of graduates in dental schools has been increased recently because of the Army Student Training Program and V-12 program. The A.S.T.P. has now been discontinued, but the V-12 program continues. (Table 6.)

The 1940 census and reports of the questionnaire by the Procurement and Assignment Service (prepared by the United States Public Health Service, January 8, 1945) show that there were, in 1940, 70,417 dentists in the United States. These were divided into categories as shown in Table 7.

Table 2.—Predental Education

	2 Years College	3 Years College	4 Years College	Degree B.S.	Beyond B.S.	Total
	4,380	1,905	346	2,275	108	9,014
Freshman class		1,334				2,562 (70 female and 90 foreign included)
	1,228	599	147	566	22	

2. O'Rourke, J. T.: Analysis of Number and Distribution of Active Dentists in the United States: J.A.D.A. 31:1097, August 1, 1944.

The entire picture is quite muddled. Graduates who were in the Army program are being discharged, while older dentists are being retained. Efforts are being made to rectify these inequalities. With[3] 28 to 30 per cent of the dental manpower in the service, and without knowing exactly what the remainder is able to do in view of their age, infirmities or other occupations in and out of dentistry, postwar planning is difficult and must be approached with trepidation. Postwar planning is also complicated as a result of a survey made by the A.D.A. War Service and War Planning Committee. Questionnaires numbering 5,282 were sent out, checked and tabulated. The report shows that the greatest number of men requested refresher and postgraduate courses in oral surgery and prosthetics. For the preventive aspects of dentistry, we find that only 290 men, or about 5 per cent, requested training in the field of children's dentistry and only 184 (3 per cent) public health. (Table 8.)

Table 3.—Distribution of Students, Class of 1940-1941

Students	State	Population*
469	California	6,907,000
474	Illinois	7,897,000
1,804	New York	13,479,000
348	Ohio	6,908,000
403	Pennsylvania	9,900,000

3,498, or about 46 per cent of total student body in dentistry (45,000,000 population).

*Approximate.

Table 4.—Registration 1943; Source of Student Body

State	Students	
New York	1,800	42.8 per cent
Ohio	386	
California	552	
Pennsylvania	432	
Illinois	641	
	3,811	
Massachusetts	322	54 per cent
New Jersey	370	
Michigan	340	
	1,032	

The material on hand illustrating the distribution of dental manpower shows that the urban centers usually have a larger number of dentists available and that there are places in the United States where people have to travel from 20 to 50 miles to get to a dentist. In fact, there are places in the midwest where entire counties have no dentist available, and, in other parts, especially the south, the ratio of population per dentist is quite high, 1 to 3,000 or more. In South Carolina, the ratio is 1 to 5,263.

Table 5.—Federal Census 1940

	Failures in States Per Cent	Ratio of Dentists to Population
Arizona	56.6	1:3,241
Delaware	49.6	1:2,538
District of Columbia	53.6	1:1,337
Florida	42.6	1:2,646
Idaho	39.6	1:2,441
Nevada	52.0	1:2,004
South Dakota	43.0	1:2,122
Washington	49.0	1:1,376
New York	15.6	1:1,314
California	17.0	1:1,268
Illinois	7.0	1:1,323
Michigan	16.6	1:1,978
Ohio	6.3	1:1,831
Pennsylvania	5.3	1:1,664
Massachusetts	3.0	1:1,530
New Jersey	42.3	1:1,547

U.S.P.H. Report.

The material on the needs of the population is, of course, limited. There is available much more which can be translated to suit the particular requirements of the person interested in the subject, but it must be remembered that no matter what we say the needs are, we still must consider the problem of demand as it may be affected by health education and other conditions.

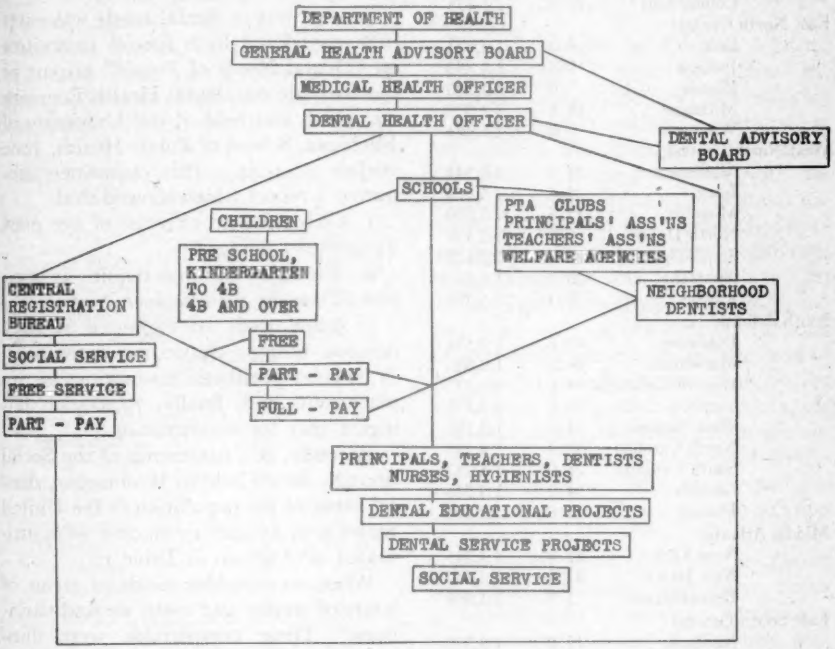
Several years ago, studies made by the

3. Hillenbrand, Harold: Dental Health for American People. New York J. Dent. 15:143-151, April 1945.

Department of Health, New York City, and the Murry and Leonie Guggenheim Dental Clinic, disclosed that, at 2 years of age, an average of 50 per cent of children had carious teeth; at 3, more than 80 per cent; at 4, about 92 per cent, and at 5, about 95 per cent.[4]

Needs can further be estimated from the figures issued by Selective Service. Out of a total of 900,000 selectees, 188,000 were rejected because of dental defects. This picture would not be bad were it not for the fact that the dental requirements were so low (only six anterior teeth, three in the upper and three in the lower jaw in opposition, and six posterior, three in the upper and three in the lower in opposition; and yet 20.9 per cent did not meet these requirements). Manpower was urgently needed and therefore dental requirements were reduced and the Army undertook a rehabilitation program, which was not only time consuming, but also costly.

As far as adults were concerned, in 1938 and 1939 we were in a position to study needs,[5] time consumed and costs to rehabilitate 1,250 adults 15 years of age and over. Restorations were made only when 60 per cent of the masticating efficiency of these patients had been destroyed or to replace anterior teeth for young adults to enable them to obtain jobs. It was found that 48 per cent needed two dentures and 24 per cent



Organization for community dental program for children enlisting cooperation of departments of health and education, welfare agencies, parents' organizations and private dental practitioners. (Strusser and Salzmann: Organization Outline for Community Dental Program, J.A.D.A. 1936.)

4. Health Dentistry for Community: University of Chicago Press, 1935.

5. Strusser, Harry: Costs of Dental Service for Indigent or Low Income Groups. J.A.D.A. 26:1912, November 1939.

*Table 6.—Percentage of Failures in Licensing Examinations, 1939-1940-1941**

District in U.S.	State	Percentage of Failures	Ratio of Dentists to Population
North East			
	Maine	2.6	1:2,241
	New Hampshire	37.3	1:2,194
	Vermont	23.0	1:2,364
	Massachusetts	3.0	1:1,530
	Rhode Island	0.0	1:1,892
	Connecticut	15.6	1:1,575
East North Central			
	Ohio	6.3	1:1,831
	Indiana	9.6	1:1,890
	Illinois	7.0	1:1,323
	Michigan	16.6	1:1,978
	Wisconsin	3.0	1:1,484
West North Central			
	Minnesota	4.0	1:1,344
	Iowa	5.6	1:1,564
	Missouri	12.6	1:1,650
	North Dakota	0.0	1:2,450
	South Dakota†	43.0	1:2,122
	Nebraska	13.3	1:1,430
	Kansas	9.3	1:1,776
South Atlantic			
	Delaware	49.6	1:2,538
	Maryland	14.0	1:2,086
	Dist. of Columbia	53.6	1:1,337
	Virginia	10.0	1:3,173
	West Virginia	11.0	1:3,186
	North Carolina	32.3	1:4,533
	South Carolina	28.0	1:5,263
	Georgia	14.0	1:3,786
	Florida	42.6	1:2,646
Middle Atlantic			
	New York	15.6	1:1,315
	New Jersey	42.3	1:1,547
	Pennsylvania	5.3	1:1,664
East South Central			
	Kentucky	11.0	1:3,575
	Tennessee	22.0	1:3,454
	Alabama	16.0	1:4,682
	Mississippi	6.0	1:5,211
West South Central			
	Arkansas	19.0	1:5,076
	Louisiana	0.0	1:2,999
	Oklahoma	11.0	1:3,141
	Texas	33.3	1:3,179
Mountain			
	Montana	21.0	1:2,020
	Idaho	39.6	1:2,441
	Wyoming	33.3	1:2,022
	Colorado	14.0	1:1,687
	New Mexico	38.0	1:4,664
	Arizona	56.6	1:3,241
	Utah	5.3	1:1,798
	Nevada‡	52.0	1:2,004
Pacific			
	Washington	49.0	1:1,376
	Oregon	23.0	1:1,305
	California	17.0	1:1,268

*Average of three years.

†South Dakota in 1941 had 100 per cent failures.

‡Nevada in 1940 had 100 per cent failures.

needed one denture, or a total of 72 per cent needed restorations in the rehabilitation program.[6] (Table 9.)

The subject of dental needs was carefully considered by a special committee on "Dental Needs of People" as part of the Institute on Dental Health Economics, which was held at the University of Michigan, School of Public Health, June 26-July 1, 1944. This committee submitted a report which showed that.

1. Children 6 to 18 years of age need 244,000,000 fillings.[3]

2. The same children require 33,000,000 fillings as maintenance care.

3. Adult needs are expressed as 285,000,000 fillings, 25,000,000 extractions, 11,000,000 prosthetic restorations or replacements and, finally, 79,000,000 fillings a year for maintenance.

Recently, at a conference of the Social Security Board held in Washington, dental needs of the population in the United States 3 to 15 and 15 or over were estimated as[7, 8] shown in Table 10.

When we consider needs in terms of hours of service and costs, we find variations.[9] These comparisons were illustrated in the work of Dorothy Fahs Beck, "Costs of Dental Care for Adults Under Specific Conditions," pages 50-51. We find the average cost of initial care recommended, $55.23; received, $52.66. We find average cost of maintenance care recommended, $13.26; received, $10.05.

6. Dentistry in Public Health Planning: J. 2nd Dist. Den. Soc. 25:8, May 1940.

7. Klein, Henry, and Palmer, C. E.: Dental Needs of Children: Milbank Mem. Fund Quart. 16:267, July 1938.

8. Klein, Henry, and Palmer, C. E.: Pub. Health Rep. 55:1258, July 12, 1940.

It is pointed out that the cost of this recommended service to the clinic is $13.87 and the cost of initial care as recommended is $48.65. If the clinic did not have annually a number of new cases for initial care, it would not have been able to maintain itself because the cost of the maintenance care to the clinic was more than the amount paid by the patients for such service. Studies of the needs of adults[9] made by the Chicago Dental Society, Chicago Industrial Diagnostic Service, showed that the cost of initial care would average about $52.47. Studies of the American Dental Association showed that the cost of initial care for males averages $48.96 and for females, $45.43, if the needs are supplied and the fees for services paid according to the fee scale of the U. S. Veterans Administration. The costs of the services rendered by W.P.A. clinics in New York City were estimated at $32.21 if dentists were paid $5,000 per annum.

Table 7.—Practice Categories Among 70,417 Dentists

Type of Practice	Number	Distribution Per Cent
General practice	66,896	95
General practice with part specialization	23,731	33.7
Oral surgery	13,661	19.4
Orthodontia	1,549	2.2
Pedodontia	1,056	1.5
Periodontia	1,479	2.1
Prosthodontia	5,422	7.7
Radiodontia	564	0.8
Full time specialty	3,521	5
Oral surgery	1,338	1.9
Orthodontia	1,057	1.5
Pedontia	211	0.3
Periodontia	141	0.2
Prosthodontia	704	1.0
Radiodontia	70	0.1

The above-mentioned studies also showed that the time needed to fulfil the requirements of the adult population varied, depending on the extent of services rendered. These variations were estimated at from 4.65 hours per patient to 8.5 hours for initial care received. When maintenance care was considered, the figures indicate 3.6 hours for services recommended and 2.4 hours for services received. The difference was indicated as those services in x-ray work and prophylaxis recommended and those received.

The Committee on Cost of Medical Care showed[4, 10] that the annual expenditure among families with incomes of $1,200-$2,000, which constituted 35 per cent of the population, was $9.01 per family. Among families with incomes of $2,000-$3,000, the annual expenditure was $16.39. Although $450,000,000 was spent annually, 60 per cent of this amount came from 25 per cent of the population (those earning $3,000 and over) and 40 per cent of the total amount spent came from 75 per cent of the population earning less than $3,000 per annum. Translating these data, we find that 90,000,000 included in the income group below $3,000 spent $178,000,000, or about $2 a person per annum, basing the figures on a population of 120,000,000.

We realize what difficulties are facing the dental profession: manpower, hours of service, costs of service. Some have recommended the use of auxiliary personnel within the present assignment of duties—dental hygienists for prophylaxis and examination; dental assistants for chair and office duties; dental technicians for the laboratory operations entailed in service to the patient. It has been found that this auxiliary staff, when properly used, reduces the number of hours per patient and increases the patient load. Klein, of the U. S. Public Health Service, has also shown that the available additional operating room,

9. Beck, Dorothy F.: Costs of Dental Care for Adults Under Specific Conditions: American College of Dentists, Committee on Socio-Economics.

10. Medical Care for American People: University of Chicago Press, 1932.

fully equipped, increases the number of patients that can be treated and increases output and service to patients.

Others have recommended that dental hygienists be trained to render additional operating service to school children, a program which has been carried on in New Zealand for twenty-one years, but what may be good for New Zealand may not be good here. Let us be practical about this phase. The dental hygienist recent graduates economic security and opportunity for advancement as they do for dental nurses in New Zealand, we would have sufficient incentive for men to study dentistry and go into public health service to practice prevention and control.

If a student has a background such as is now given in our dental schools, or a better one, he can be given additional assignments and, by experience, he will

Table 8.—Number and Percentage of Dental Officers Desiring Training in Specialized Fields

Field of Training	Number of Dentists			Percentage of Dentists†		
	Total	From Private Practice*	From Dental School or Internship	Total	From Private Practice*	From Dental School
Oral surgery	2,571	1,848	723	48.7	45.3	60.3
Prosthetics	2,047	1,599	448	38.8	39.2	37.4
Crown and bridge work	1,353	997	356	25.6	24.4	29.7
Anesthesia	1,201	855	346	22.7	20.9	28.9
Orthodontia	1,032	678	354	19.5	16.6	29.5
Periodontia	525	390	135	9.9	9.6	11.3
Plastic surgery	411	281	130	7.8	6.9	10.8
Operative dentistry	378	324	54	7.2	7.9	4.5
Roentgenology	350	288	62	6.6	7.1	5.2
Children's dentistry	290	223	67	5.5	5.5	5.6
Public health	184	154	30	3.5	3.8	2.5
Number of questionnaires on which percentages are based	5,282	4,083	1,199			

*Includes officers who combined a salaried position with private practice.

†Percentages do not total 100 since more than one field of training could be checked.

as a professional worker has been known to us in the United States for twenty-seven years and only thirty-three states have licensed the dental hygienist and have permitted her to practice within the present confines. How long will it take to change curricula and teaching methods to give the hygienist this additional operative skill, experience and background? It certainly will take more than a lifetime for states to change their licensure laws and permit such a change in the practice of dentistry. Secondly, if we spent as much time, effort and money to assure our dental students and be qualified in other branches of dental service, but if you limit the initial preschool and school requirements and the student is taught to perform but one operation, there is a loss of incentive and a loss in possibility of future development. The best comment on this subject appeared in the February 2 issue of the *British Dental Journal*.[11]

The Government, recognizing that much of the good work done in the schools was being wasted because it was not effectively followed up, has decided to set up a corps

11. Brit. D. J., 78:84, February 2, 1945.

of salaried dental officers for the purpose of attending ultimately to all adolescents. It is however realized that this would take a long time to build up and in the meantime it is proposed to utilize the services of selected school nurses working under the direct supervision of dental surgeons. That some such development would become inevitable seemed to be obvious when the original scheme was inaugurated twenty-one years ago, since it was clear that no logical boundary could be drawn between the treatment of a simple cavity in a child's molar and that requiring a higher degree of skill and training than is given to the "dental nurses." It is, indeed, natural that a girl who is interested in her work should desire to exercise her skill on problems of gradually increasing difficulty until she ultimately reaches a stage when the term "simple cavity" has ceased to have the meaning originally attached to it when she was under training. . . .

It is possibly not without significance that a leading article in the *New Zealand Dental Journal* on the School Dental Service is followed by one headed "The Back Door Again." This article deals with a proposal that dental technicians should be permitted to undertake the clinical practice of prosthetics without undergoing a full professional education.

Similar recommendations have been made here in the United States.

It can be seen, therefore, that the problem of dental care for the American people is complex and too immense to be undertaken. We have neither the manpower nor the facilities for doing initial service for the entire population. Let us therefore consider it from the point of view of rendering service to the largest number where the greatest good can be derived. This necessitates giving priority to certain groups. In 1931, when the economic conditions of the dentist and the country at large were poor, I suggested universal dental care for children, using available clinical and private dental resources for a control program.[12]

Today, we face the problem from another point of view. Dentistry is now recognized as a health service and many have recognized the value of early and continued dental care as a health measure, and also as a means of serving the population on a maintenance basis. The purpose is to reduce the costs so that the average family may be able to secure dental care on an annual basis. Many methods have been mentioned, namely tax funds, grants-in-aid, federal grants to the states and, in turn, to the counties and local communities, prepayment plans, voluntary health insurance and compulsory health insurance.

Public health dentistry was unknown a decade ago, but today we have in the United States Public Health Service regional consultants as well as consultants

Table 9.—Dental Needs of 1,250 Adults

Clinic	Number of Patients	Fillings	Extractions	Persons Needing Two Dentures	Per Cent	Persons Needing One Denture	Per Cent	Persons Needing No Dentures	Per Cent	Patients Needing Dentures Per Cent	Total Number of Dentures
Queens	250	1,931	939	63	25	58	23	129	52	48	184
Brooklyn	250	331	1,001	174	70	49	19	27	11	89	397
Bronx	250	1,828	1,131	112	45	73	29	65	25	74	297
Harlem	250	1,075	1,238	150	60	44	18	56	22	78	344
Hecksher	250	1,419	914	99	40	77	31	74	29	71	275
	1,250	6,584	5,223	598	48	301	24	351	28	72	1,497

12. Health Dentistry for Community. University of Chicago Press, 1935, Appendix A, p. 69.

at the main office located at Bethesda.[13] Before 1935, when the Social Security Act was passed, there were but fifteen states conducting dental hygiene programs. By 1940, twenty-three additional states adopted programs. It can also be noted that special courses were introduced at Harvard, Michigan, Johns Hopkins and other schools, and dentists were admitted to these special training courses leading to a master of public health or master of science in public health degree, or to a certificate in public health. In 1938, the Conference of State and Territorial Health Officers, with the Surgeon General, adopted minimum qualifications for public health dentists. Dentistry has received support in public health programs under Titles V and VI of the Social Security Act. It may interest you also to know that, in 1935, there were eighteen full-time dental health administrators. In 1941, there were 154 full-time dental health administrators.

Table 10.—Dental Needs of Children 3-15 and Over 15

	Children (3-15)	Adults Over 15	Total Services in Millions
Examinations	26.7	98.7	125.4
Extractions	21.4	217.1	238.5
Fillings	197.4	434.3	631.9
Prophylaxes	26.7	98.7	125.4
Consultations	26.7	98.7	125.4
Crowns and bridges		39.5	39.5
Partial and full dentures		39.4	39.4

The practice of public health dental programs is in keeping with the recommendations of the American Dental Association adopted by its House of Delegates in convention in 1944 as a result of the recommendations of its Council on Dental Health.

13. Salzmann, J. A.: Dental Service for Population Groups. J. Am. Coll. Dentists 11:280, September 1944.

1. Research: Adequate provisions should be made for research which may lead to the prevention or control of dental diseases.

2. Dental health education: Dental health education should be included in all basic educational and treatment programs for children and adults.

3. Dental care:

(a) Dental care should be available to all regardless of income or geographic location.

(b) Programs developed for dental care should be based on the prevention and control of dental diseases. All available resources should first be used to provide adequate dental treatment for children and to eliminate pain and infection for adults.

(c) Dental health is the responsibility of the individual, the family and the community, in that order. When this responsibility, however, is not assumed by the community, it should be assumed by the state and then by the federal government. The community in all cases shall determine the methods for providing service in its areas.

4. In all conferences that may lead to the formation of a plan for dental research, dental health education and dental care, there should be participation by authorized representatives of the American Dental Association.

Programs in public health dentistry can be tailored to the needs of the population and to the ability of a community to pay for the necessary service. I do not feel that the dentist should carry the community's total dental financial load. He should carry his share as a citizen and member of the community, but he should not be expected either to level costs or to give service gratis. He should bear the responsibility and share the burden. We are all aware that the A.D.A. on numerous occasions has declared itself against compulsory health insurance. There are some in the field who hold the opinion that the manner in which funds are collected for an over-all program is the business of the public, but the manner in which the services are to be rendered, as well as the extent and type of service, is the business of the dental profession.

I have often stated that the best type of program is the one that arises from the local community. At the institute which I mentioned earlier, the question of the dental program was discussed at length. The group came to the conclusion that the local community should administer the program, should use the facilities on hand and should have the assistance offered by grants in aid or outright grants from the state and federal government to do the complete job for children 3 to 18 years of age. It must be recognized that the economic situations of communities differ and that the facilities available in different communities vary. The programs adopted by these communities would therefore vary in accordance with the material, facilities and funds that the community can supply. We know that there are parts of the United States 40 to 50 miles removed from a dental office, and it has recently been reported that there are whole counties without a dentist.

Under these circumstances, the setting up of a program would depend on the local conditions and the remedy to be applied to the particular circumstances. In all of these plans, the important phases are supervision, for quality of service, and to combine clinical research with laboratory research. There is still a great deal to be learned in administration and in setting up of controls to evaluate various programs. Unless we have the same type of data from various parts of the country, we will not be able to compare and evaluate.

Research

We are all familiar with the bill introduced by Senator Murray, known as S.190. This bill has for its main objective research in dentistry, which will come under the jurisdiction of the United States Public Health Service. Under this bill, expenditure of a million dollars is contemplated for research, which will be conducted in (1) dental decay, (2) periodontal disease and (3) focal infection. Clinical research, as well as laboratory research, will be carried on under the provisions of this bill, and it is planned to use facilities not only in public health service, but also in the colleges, institutions and other research groups.

Under dental health education, it is well known that a service program without health education is unsatisfactory just as a health education program without service is not advisable. Health education plays an important part in school health education work, but dental health education should be included not only for our school children, but also in the professional schools, such as nursing, medical and dental. Materials and projects should be set up and made available for the teacher's use in her school work.

Dental Care

I have spoken before of community health problems and setting up programs to satisfy the needs of the community. It is recognized that the best means available for the control of dental disease is initial and maintenance service for the child at school. I have selected a number of programs, as shown in the accompanying graph.[14]

This will give you an organization outline for a community dental health program wherein the dental profession, the educational authorities and the community at large through its P-TA clubs and welfare agencies all cooperate in carrying out this program.[15] You will note that, in this outline, there is a general inspection of all children, with referral to the private practitioner. The individual child who cannot afford to pay for the service is referred by the

14. Walls, R. M.; Lewis, S. R., and Dollar, M. L.: Dental Needs of Children: J.A.D.A. 28:1541, September 1941.

15. Strusser, Harry, and Salzmann, J. A.: Organization Outline for Community Dental Program: J.A.D.A. 23:2378, December 1936.

dentist to a central registration bureau. This bureau, after investigation, makes provision for the care of the child either in a clinic or in private offices, and makes arrangements for payment for such service. Under a plan of this type, it may be possible for the central bureau to pay the entire bill and the family may pay on an installment basis to the registration bureau.

Another method of operation considers a population of 100,000.[16, 17] In a population of this size, we find about 15,000 children. That gives us approximately 2,000 children in each school year. If we take the economic situation in the particular community into consideration, a program can be set up to give health education and dental care. If the community wishes to support the complete program for all of the children, that is possible either by using existing facilities or by setting up facilities in the schools or at health centers. It has been found by experience that the most advantageous setup is to use the schools and health centers. Surveys have shown that if we allow 1,500 hours per dentist per annum, a dentist can take care of 1,000 children, exclusive of prophylaxis, which can be given by the dental hygienist. We can use auxiliary personnel to save the time of the dentist.

These school units could take care of the children from kindergarten through 4B, giving initial care to the kindergarten group and continuing to give maintenance care from then on. If the community decides to carry on a complete health education program for all of the children and dental service for only 50 per cent of the children, taking into consideration that 50 per cent of the children can obtain complete care at their private dentist, it would require ten one-chair units for the schools with one part-time dentist and one full-time hygienist on service and one six-chair health center unit, which could be set up, four for dentists, two for hygienists, with dental assistants for clerical services and general assisting and sterilization. In this way, 15,000 children would receive health education and followup and 8,000 would receive complete dental care in the clinic. This type of setup can be furnished on a per capita cost of 65 to 70 cents, or a little over $4 per child per annum. It is the method offering the greatest return on the investment and the result is control of dental caries, saving of time and benefit to the community as a whole from a health point of view.

A third suggestion: Some time ago, we were discussing the problem of manpower and the available dentists to serve the population of the country. We must all agree that the distribution of the dentists is very uneven. In order to be able to start a program of control, we must give priority to children. We must set up the program on a community level and see to it that the dentist is properly paid and that the program permits advancement and incentives and builds a public health understanding, among not only the profession, but also the public.

Summary

We find that we have about 70,000 dentists in the United States. We also find that there are about 24,000,000 children in the group 2 to 14 and that 25,000 dentists would be necessary to take care of the children for both initial and maintenance care. Therefore, we have a remainder of 45,000 dentists in the country, and if those 45,000 dentists would take care of the population from 14 to 65, we would have a ratio of 1 to 2,000. It has been noted that not more than 25 per cent of the people avail themselves of dental care in any one year. It has also been noted that we

16. Strusser, Harry: Control of Dental Caries by Community Planning: New York J. Dent. 14:218, June-July 1944.

17. Strusser, Harry: Comprehensive Dental Program: J.A.D.A. 28:1534, September 1941.

have facilities for the education of 3,300 students per annum per class. If we provide the inducements to allow for a graduate group of 3,500 to 4,000 per annum, we could therefore maintain the 45,000 dentists to care for the adult group and to add 2,000 dentists per annum to care for the increment needs of the child above the fourteenth year. In this way, 2,000,000 children on maintenance care would be added annually and the ratio of dentists to the population would be maintained for the adult population. Little dental service is demanded after 65.

Under this type of arrangement, with manpower at 3,300 additional graduates annually, in about thirty years the entire population would be on a ratio of one dentist per thousand. Our 15-year-olds would now be over 40 years of age and on maintenance care. If the number of graduates is increased to 4,000, the maximum of one per thousand in the population can be reached in about twenty years.

It is interesting to note that the third phase of the program as outlined in the A.D.A. principles is now taking shape with the introduction of a bill in the House of Representatives known as H.R. 2234, introduced by Mr. Traynor on February 16, 1945, and providing aid to the states and to the communities for a community program and that for the fiscal year ending June 30, 1946, the sum of $7,000,000 shall be authorized.

175 Fifth Avenue.

RESORPTION OF EMBEDDED TEETH*

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Any tooth that remains completely embedded, particularly over a long period, is liable to undergo resorption. Most often, the resorptive process originates on the surface of the enamel; less frequently, at the cemento-enamel junction, and, rarely, on the surface of the cementum. Resorption is preceded by degeneration and disappearance of the enamel epithelium, after which the enamel comes in direct contact with connective tissue, this contact, in turn, resulting in the resorption. The dental structures that have been destroyed by resorption are invariably replaced by bone of varied density, and almost the entire tooth may be destroyed without any symptoms. Among those who have described this type of resorption are Hopewell-Smith,[1] Worman[2] and Kronfeld.[3] Worman's observations were made on embedded teeth of dogs.

A maxillary cuspid which has undergone partial resorption is shown in Figure 1. Figure 1 *a* is the roentgenogram of two embedded maxillary cuspids. Irregular defects are seen in the apical portion of the crowns of both of them. A longitudinal section that was made of the one on the right is shown in Figure 1 *b*. The tooth structure that has been resorbed has been replaced by bone, a rough and irregular surface remaining. Resorption

*From the Section on Dental Surgery, Mayo Clinic.

1. Hopewell-Smith, Arthur: Normal and Pathological Histology of Mouth. Ed. 2. Philadelphia: P. Blakiston's Son & Co., 1918, Vol. 2, pp. 23-26.

2. Worman, H. G.: Histopathologic Study of Impacted Teeth. J.A.D.A., 16:1885-1899, October 1929.

3. Kronfeld, Rudolf: Histopathology of Teeth and Surrounding Structures. Ed. 2. Philadelphia: Lea & Febiger, 1939, pp. 273-276.

has extended to the site of the original pulp chamber, which has now become obliterated by the formation of secondary dentin, and the secondary dentin is, in turn, undergoing resorption.

That the onset of resorption is not necessarily preceded by the destruction of all the enamel epithelium that covers the crown is suggested by roentgenograms, which may evidence resorption on a limited surface of the crown, while, adjacently to the remainder of the crown, the radiolucent line of uniform thickness representing the enamel organ is still present and intact. Resorption that has made any appreciable progress will produce in the tooth a defect readily discernible in the roentgenogram.

Contrary to popular belief, the teeth that are completely embedded and have no communication with the oral cavity are those that most often undergo resorption. The dental histories and roentgenograms of 300 unerupted teeth that had undergone resorption were reviewed recently in an effort to determine the correctness of this observation, and it was found that 240 (80 per cent) appeared to be completely embedded. The crowns of the majority of the remaining sixty teeth had emerged through the bone, although these teeth were covered by soft tissue, and one could not exclude the possibility of an opening through the soft tissue that might communicate with the oral cavity. In a few instances,

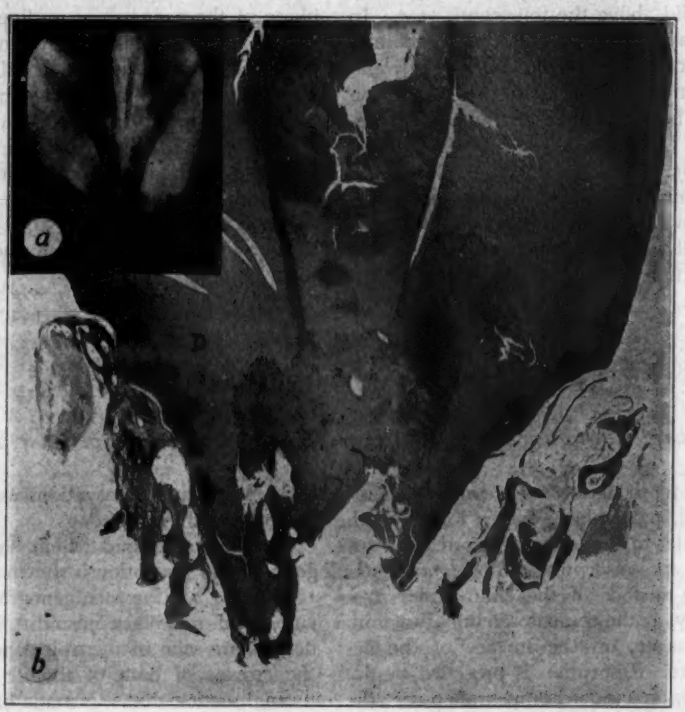

Fig. 1.—*a*, embedded cuspids that have undergone resorption. *b*, portion of crown that has undergone resorption. *B*, bone; *D*, dentin; *SC*, secondary dentin.

an opening from the oral cavity direct to the crown of the unerupted tooth could be demonstrated by means of a probe.

The 300 embedded teeth considered here consisted of eight deciduous molars and sixty-six supernumerary teeth of which sixty-one were mesiodentes, and the remaining 226 were of the normal complement of teeth in the adult person. The distribution of teeth undergoing resorption in the latter group is shown in Table 1. This group, which is made up of a consecutive series that was obtained from the cross index, represents fairly accurate data as to incidence of the teeth involved. It will be noted that 106 (46.9 per cent) of the teeth involved are maxillary cuspids, and the mandibular cuspids are not greatly exceeded in number by the mandibular third molars. This finding is significant since noneruption of third molars far exceeds noneruption of cuspids. One can therefore conclude that the incidence of resorption of embedded cuspids is appreciably greater than that of embedded third molars. One of us (E.C.S.)[4] has previously called attention to the high incidence of resorption of embedded maxillary supernumerary central incisors, or mesiodentes. It was noted that such teeth may be almost completely resorbed before the age of 35. It is also of interest that unerupted mesiodentes are, on the average, more completely embedded and covered by bone than are other unerupted teeth. Three mesiodentes that have undergone resorption are shown in Figure 2.

Table 1.—Distribution of 226 Embedded Teeth in Which Resorption Occurred

Type of Tooth	Maxillary	Mandibular
Central incisor	4	1
Lateral incisor	1	0
Cuspid	106	17
Second bicuspid	2	7
Third molar	64	24
Total	177	49

The noneruption of deciduous molars is, in itself, a rarity, and most of them probably undergo resorption. That resorption may take place early and progress rapidly is evidenced by roentgenograms of two of these teeth. (Fig. 3.) Figure 3 *a* shows an embedded maxillary left second deciduous molar in a person 20 years old. The patient said that this tooth had never erupted. Figure 3 *b* is the roentgenogram of an embedded deciduous molar in the maxillary first bicuspid region. It was made when the patient was 13 years old. The deciduous tooth had failed to erupt and had undergone extensive resorption at that early age. The roots of these teeth may have been completely resorbed, or they may have failed to develop. The roentgenogram in Figure 3 *c*, that of a mandibular second deciduous molar, was made when the patient had reached the age of 47. This tooth was almost completely

Table 2.—Ages of Patients Whose Embedded Teeth Were Undergoing Resorption, as Compared with Ages of a Like Number of Routine Dental Patients

Age, Years	Patients with Embedded Teeth Undergoing Resorption		Routine Dental Patients	
	No.	Per Cent	No.	Per Cent
10-19	4	1.6	21	8.2
20-29	8	3.1	50	19.5
30-39	51	19.9	52	20.3
40-49	58	22.7	66	25.8
50-59	73	28.5	40	15.6
60-69	52	20.3	25	9.8
70-79	9	3.5	2	0.8
80-89	1	0.4	0	0
Total	256	100	256	100
Average age	50.0		40.4	

4. Stafne, E. C.: Supernumerary Upper Central Incisors. D. Cosmos, 73:976-980, October 1931.

resorbed. No definite history could be obtained as to whether this tooth had failed to erupt. It is possible that the tooth had erupted and had later become embedded as a result of inclusion. In such instances, the deciduous tooth remains in its original location and the alveolar bone grows around and over it so that it may become completely enveloped by bone. Embedded deciduous molars may be so completely resorbed that they are no longer discernible in the roentgenogram.

Fig. 2.—Three embedded mesiodentes that have undergone extensive resorption.

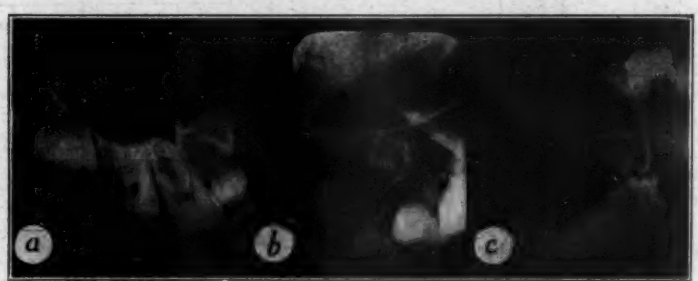

Fig. 3.—Three embedded deciduous molars that have undergone resorption: *a*, from patient aged 20; *b*, from patient aged 13; *c*, from patient aged 47.

Five embedded deciduous molars that had undergone resorption were seen in a person nineteen of whose teeth of the permanent dentition had failed to erupt. All of the deciduous teeth had undergone extensive resorption. The embedded left mandibular deciduous molars are shown in Figure 4 *a*. Resorption of the first deciduous molar had been so extensive that little, if any, evidence of the presence of tooth structure was revealed by the roentgenogram. Clinical examination revealed a drainage of purulent material through a fistulous tract, which communicated with the embedded second deciduous molar. The region directly in front of the second deciduous molar was explored incidentally to the removal of what remained of it, but there was no apparent evidence of tooth structure. A portion of what appeared grossly to be bone was removed and decalcified. Microscopic examination revealed a tissue consisting chiefly of bone, throughout which were scattered fragments of unresorbed dentin. (Fig. 4 *b*.)

The 300 embedded teeth were found in 256 persons, of whom thirty-one had two, five had three and one had four teeth undergoing resorption. One hun-

dred and thirty-four patients were male and 122 were female. Thirty-seven embedded teeth in which there was no evidence of resorption were also present in twenty-eight of the patients. These teeth consisted of thirty-one third molars, five cuspids and one lower second bicuspid.

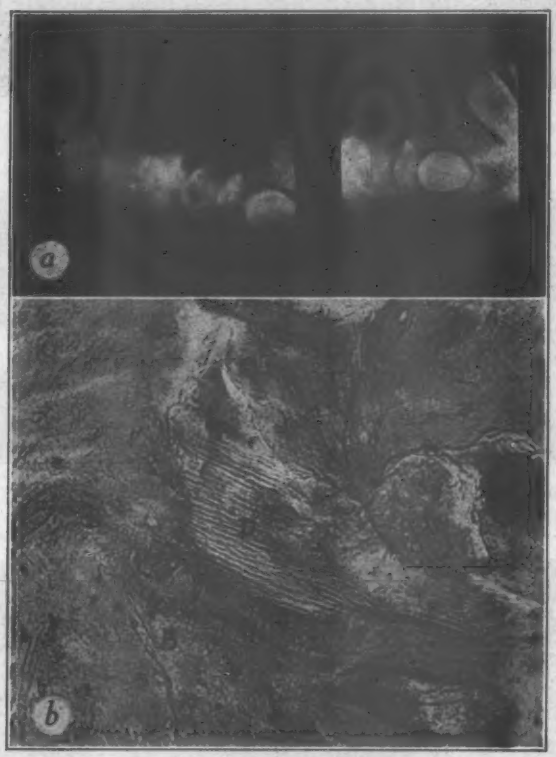

Fig. 4.—*a*, mandibular first and second deciduous molars that have undergone extensive resorption. *b*, tissue obtained from region of first deciduous molar: *D*, fragment of unresorbed dentin; *B*, bone.

The ages of the patients ranged from 13 to 81 and the average age was 50. In Table 2 is shown the distribution of age in ten-year periods of the patients in whom resorption occurred; also of a control group, which comprised 256 consecutive dental patients seen in the Section on Dental Surgery.

From Table 2, it is noted that the average age of the control group is 40.4 years, or approximately ten years less than that of the group in which resorption of embedded teeth occurred. Some measure of actual incidence of resorption as related to age can be arrived at by comparing the relative percentages of persons in the same age brackets. From 10 to 49, the percentage of persons in each ten-year period was in each instance greater in the control group than in that group in which resorption occurred, although the difference in the two periods from 30 to 49 was not appreciable. Beginning at 50 years of age,

Fig. 5.—Embedded maxillary cuspid that has undergone resorption: *a*, film made in 1931; *b*, made in 1934; *c*, made in 1942.

Fig. 6.—Embedded maxillary cuspid that has undergone resorption: *a*, film made in 1926; *b*, made in 1939; *c*, made in 1942.

Fig. 7—*a* and *b*, embedded maxillary cuspid in which there has been no increase in resorption over period of fifteen years: *a*, film made in 1927; *b*, made in 1942; *c*, dentigerous cyst associated with cuspid that has undergone resorption.

the percentage of persons in like age brackets becomes much greater in the group in which resorption occurred than in the control group, and the ratio between the two groups becomes increasingly greater with each succeeding ten-year period. It appears, therefore, that the incidence of resorption of embedded teeth is greater in the late than in the early decades of life.

Thirty-two of the teeth that were undergoing resorption were observed roentgenographically over periods ranging from three to sixteen years. In thirteen

instances, there was evidence that the teeth under observation were undergoing active resorption. In the remaining nineteen, there was no evidence of increase in the size of the defect in the tooth that had been produced by the resorption, and the resorptive process apparently had become inactive. In four cases, roentgenograms that had been made prior to the onset of resorption were available. In one of these cases, the patient was 29 when seen first. A roentgenogram made in 1931 revealed an unerupted maxillary cuspid in which no apparent defect could be seen. (Fig. 5*a*.) May 8, 1934, a defect had appeared at the apex of the crown and another more extensive one was seen at the junction of the crown and the root. (Fig. 5 *b*.) A roentgenogram made February 9, 1942, revealed that resorption of the apex of the crown had advanced only slightly, and there was very little if any increase in the size of the defect in the cervical region. (Fig. 5 *c*.) In this case, resorption occurred at a relatively early age. It had its onset and had progressed fairly rapidly for three years. During the following seven years, little additional progress in resorption had been made.

Resorption of a right maxillary cuspid was first noted November 24, 1926, in a patient aged 56. (Fig. 6 *a*.) Roentgenograms were also made in 1939 (Fig. 6 *b*) and in 1942 (Fig. 6 *c*), when the patient had reached the age of 72. In this case, the resorptive process involved the entire surface of the crown. There was a slight increase in resorption from 1926 to 1939, and from 1939 to 1942 it appeared that the tooth had undergone more rapid resorption. In this instance, there had been a slowly progressive resorption continuing over a period of more than sixteen years, the exact time being uncertain since there was no evidence available as to the time of onset of the resorptive process.

An instance in which there had been no increase in resorption over a period of fifteen years is illustrated by Figure 7 *a* and *b*. A roentgenogram made in 1927 of a patient aged 37 showed an unerupted left maxillary cuspid in which a portion of the lateral side of the crown had undergone resorption. (Fig. 7 *a*.) One made in 1942 (Fig. 7 *b*) revealed that there had been no increase in the size of the defect, and resorption apparently became inactive before 1927.

Six (2 per cent) of the embedded teeth that had undergone resorption were associated with dentigerous cysts. The teeth involved were three cuspids, one mandibular second bicuspid, one mandibular third molar and one mesiodens. The incidence of cyst formation was relatively higher than that for unerupted and impacted teeth in general, and here again it may be significant that most of the teeth in this series were completely embedded in bone, a situation that is no doubt favorable for the growth of a dentigerous cyst.

Figure 7 *c* illustrates a mandibular cuspid which has undergone resorption and from which a dentigerous cyst has also developed. In such instances, resorption no doubt takes place before development of the cyst.

Conclusion

Teeth that are completely embedded and have no communication with the surface most often undergo resorption.

The incidence of resorption of embedded teeth is highest in the later decades of life, although resorption may, in some instances, occur fairly early.

There appears to be a wide variation in the rate and extent of resorption, which may continue over a long period or, after a relatively short period of activity, may be completely arrested.

The resorption in itself is probably of no clinical significance. Removal of an unerupted tooth that has undergone resorption is difficult and it is therefore advantageous to remove it before the onset of resorption if removal is indicated.

SIMPLIFIED JACKET CROWN PREPARATION

Leonard H. Burg, D.M.D., Newark, N. J.*

The porcelain or acrylic jacket crown is one of the most esthetic and satisfactory means of restoration possible in the mouth, yet they are often failures in individual cases.

In my opinion, 90 per cent of these failures are due to either faulty preparation or damage to the pulp tissue.

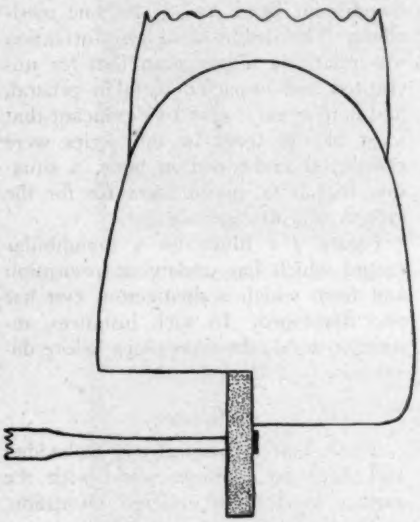

Fig. 1.—Relieving incisal edge.

Let us consider these two cases individually.

In many cases, the jacket crown fractures or is constantly dropping out, usually because insufficient tooth structure has been removed. All the enamel has not been taken away and there is little or no shoulder present, and this leaves the crown much too thin, on both the lingual and the labial surfaces and makes a good marginal adaptation almost impossible.

As to the second cause of failure, enough tooth structure has been removed but so much frictional heat has developed from grinding away the labial and lingual enamel that frequently the pulp is damaged. In many cases, the tooth becomes devitalized and an abscess develops.

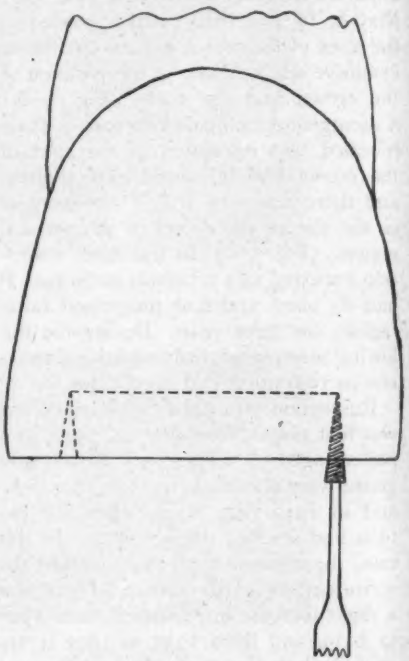

Fig. 2.—Undermining enamel with No. 700 bur on straight handpiece.

In following the simplified technic here described, both of these pitfalls are

*Lieutenant (DC) USNR.

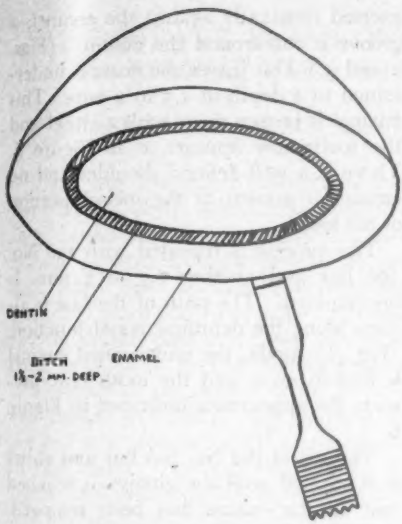

Fig. 3.—Breaking away enamel with chisel.

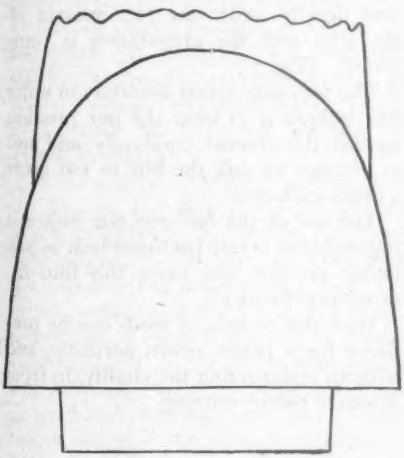

Fig. 4.—Shoulder established at incisal portion.

eliminated, with the additional advantage that operating time at the chair will be cut almost in half. A little practice will enable one to prepare a tooth for a jacket crown in fifteen minutes without endangering the pulp in any way.

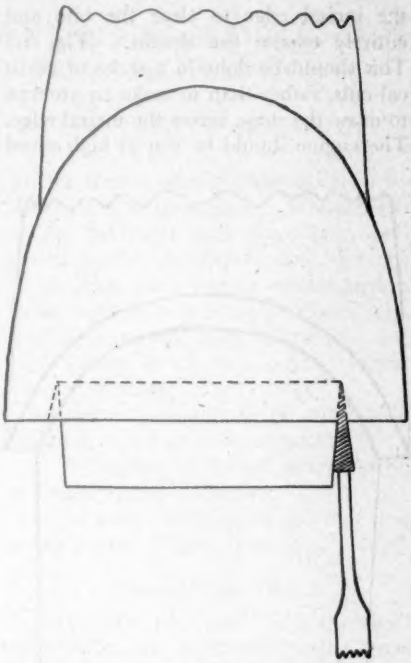

Fig. 5.—Further undermining of enamel.

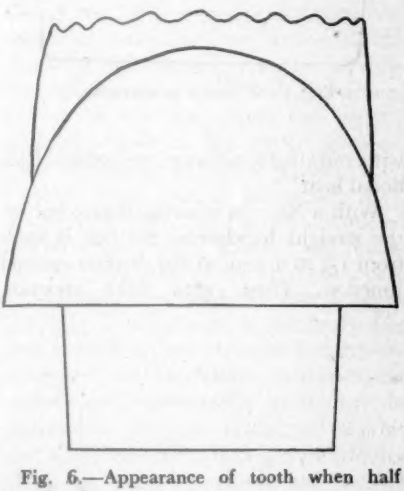

Fig. 6.—Appearance of tooth when half completed.

With a large heatless wheel on a mandrel, sufficient enamel is removed from

the incisal edge to clear the bite and entirely expose the dentin. (Fig. 1.) This should be done in a series of vertical cuts, rather than to make an attempt to draw the stone across the incisal edge. The engine should be run at high speed

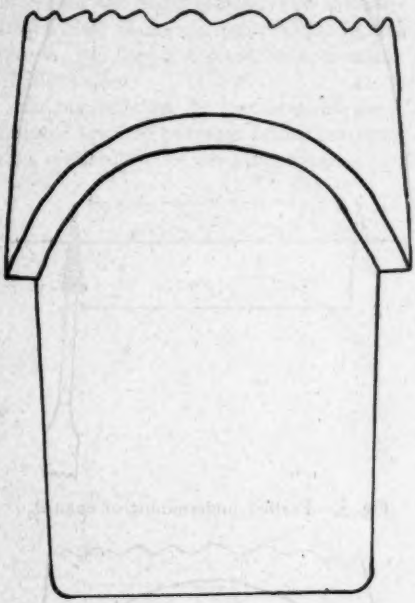

Fig. 7.—Finished preparation.

with only light pressure, to reduce frictional heat.

With a No. 700 tapering fissure bur on the straight handpiece, the bur is sunk from 1.5 to 2 mm. at the dentino-enamel junction. Then, with light pressure, exerted constantly against the enamel, a groove is cut around the dentin. (Figs. 2 and 3.) This leaves the enamel undermined to a depth of 1.5 to 2 mm. This enamel is broken away with a chisel and the tooth now appears as in Figure 4. There is a well-defined shoulder and no enamel is present at the incisal portion of the tooth.

This process is repeated with the No. 700 bur and another 1.5 to 2 mm. is undermined. The path of the bur is always along the dentino-enamel junction. (Fig. 5.) Again, the undermined enamel is broken away and the tooth now presents the appearance indicated in Figure 6.

The use of the No. 700 bur and chisel is continued until the gingiva is reached and all the enamel has been removed. A definite shoulder is always present, through each successive step. Then with an end-cutting bur, the shoulder is carried slightly under the free margin of the gum and the preparation is completed. (Fig. 7.)

The only precaution necessary in using this technic is to keep the bur pressing against the enamel constantly and not to attempt to sink the bur to too great a depth each time.

The use of the No. 700 bur makes it impossible to create frictional heat as any undue pressure will cause this thin fissure bur to break off.

With this technic, a tooth can be prepared for a jacket crown perfectly, and without endangering the vitality, in from fifteen to twenty minutes.

POSTWAR PLANS OF DENTISTS IN SERVICE: IV. SPECIAL ASPECTS OF PRIVATE PRACTICE*

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Plans are being formulated, in the American Dental Association and the state dental societies, in the federal and state governments and in voluntary agencies, which look to a definite national postwar program to improve dental health. In this connection, two bills have been introduced in the current session of Congress at the request of the American Dental Association. The purpose of the one is to provide federal grants-in-aid to the states, "political subdivisions of states, and municipalities for developing and maintaining dental health plans consisting of effective measures for dental health education; (and) effective measures for the prevention, treatment, and control of dental diseases . . ." and, of the other, "to provide for, foster, and aid in coordinating research relating to dental diseases and conditions; (and) to establish the National Institute of Dental Research. . . ."

It goes almost without saying that the key to the success of any dental health program is the dentist. Without him, no community can even attempt the beginnings of a program to meet the dental problems of its citizens. Certainly, the return to civilian practice of 20,000 dentists, and it is this group with which this series of papers has dealt, can have a profound influence on any dental health program. Of primary importance will be their eventual distribution in relation to the population. While many of the pertinent data have been presented in the paper preceding this one in the series, there remain certain aspects to be explored which have a direct relation to dental planning. These are:

1. Trends in the location and movement of dentists.
2. Interest among dental officers in engaging in group private practice.
3. Willingness of dental officers to go to areas in need of dentists.

It is with these questions that the present paper is concerned.

Source of the Data

These data are based on a questionnaire which was distributed to the more than 21,000 dental officers in service by the War Service and Postwar Planning Committee of the American Dental Association, with the cooperation of the chiefs of the respective dental services. The questionnaire itself was reproduced in full in the first paper, on general findings. Most of the officers received their questionnaires in September and October 1944, and, by January 1, 1945, 7,549, more than a third, had completed and returned them. These 7,549 replies are the foundation of the present reports.

As to the representative character of the data, it was shown in the first paper that the officers who replied to the questionnaire and the entire dental officer population corresponded so closely in distribution by age, branch of service and place of origin that generalizations about the entire group from the findings of the sample could be employed with some confidence.

*The preceding papers are: I. General Findings, J.A.D.A., 32:568, May 1, 1945. II. Plans for Additional Training, J.A.D.A., 32:692, June 1, 1945. III. Private Practice, J.A.D.A., 32:803, July 1, 1945.

†Chairman, War Service and Postwar Planning Committee, American Dental Association.

‡Statistician, Division of Public Health Methods, U. S. Public Health Service.

Table 1.—Geographic Movement of Former Practitioners Who Are Changing State of Practice

Geographic Division in Which Dentist Practiced Before Entering Service	Percentage in Area Changing State of Practice	Number Changing State of Practice	Number of Dentists Going to Each Geographic Division								
			New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
New England	6.3	20	8	6	—	1	2	—	—	1	2
Middle Atlantic	7.8	127	17	27	12	2	24	2	4	6	33
East North Central	11.6	143	2	6	30	5	19	2	13	8	58
West North Central	16.9	114	1	2	12	10	7	—	10	18	54
South Atlantic	6.8	21	—	1	2	—	10	1	—	—	7
East South Central	5.6	10	—	1	1	—	5	—	—	1	2
West South Central	10.0	31	1	1	—	5	2	3	2	9	8
Mountain	13.5	18	—	—	—	—	—	—	2	1	15
Pacific	3.3	23	1	—	1	—	—	—	—	9	12
Total	9.3	507	30	44	58	23	69	8	31	53	191

Trends in the Movement of Dentists

In the preceding paper, data were presented by state to show for every man who left private practice (1) the number that would return, (2) the number that would come from other states and (3) the number that would enter private practice for the first time. It was seen that about a quarter of the men who had been in practice before the war planned a change of community, and that almost half of these intended to move to new states. Marked trends toward certain sections of the country and away from others were observed among the latter. These are summarized by geographic division in Table 1.

The first column of the table shows the percentage of former practitioners now in service who contemplate changing their state of practice. The two regions in which a substantial number and proportion of these men were located are the East and West North Central States (11.6 and 16.9 per cent). In contrast, only 3.3 per cent of the men who practiced in the Pacific States before the war are considering a change of state.

In most of the nine geographic divisions of the country, a sizable number of the changes are interstate ones within the same region. For example, of twenty officers who formerly practiced in New England and are planning to change states, eight are moving to other states in the same region. The three divisions in which a very material number of changes to other sections will apparently take place are the Middle Atlantic and the East and West North Central States.

In the Middle Atlantic States—New York, New Jersey and Pennsylvania—21 per cent (of 127 officers) are staying in the same section and 29 per cent are thinking of moving to neighboring areas. But 19 per cent would like to establish themselves in the South Atlantic States, chiefly Florida, and 26 per cent have in mind the states on the West Coast, chiefly California.

In the East North Central States, while 21 per cent are staying in the same group of states, 13 per cent look

Table 2.—Geographic Distribution of Dental Officers Entering Private Practice for First Time

Geographic Division	Dental Officers Entering Practice for First Time			Persons (in Thousands) per New Practitioner*
	Number	Percentage Distribution	As Percentage of Former Practitioners in Service	
New England	161	9.5	51.1	50.2
Middle Atlantic	547	32.3	33.5	47.2
East North Central	272	16.0	22.1	95.9
West North Central	133	7.9	19.7	92.2
South Atlantic	167	9.9	53.9	106.0
East South Central	63	3.7	35.0	160.0
West South Central	108	6.4	34.7	113.9
Mountain	50	2.9	37.6	80.4
Pacific	194	11.4	27.9	56.5
United States	1,695	100.0	30.9	75.1

*Based on estimated civilian population, November 1, 1943. Bureau of the Census: Population-Special Reports. Series P-44, No. 3, February 15, 1944.

to the South (essentially to Florida) and 41 per cent would move to the Pacific States. In the West North Central States, only 9 per cent are staying in the same region; but 47 per cent are considering removal to the Pacific Coast and 16 per cent to the Mountain States.

It should be noted, in observing these three sections of the country, that as proximity to the far west increases, the proportion that would go there increases; so that we find a fairly even split in the Middle Atlantic group between the number going to Florida and those going to California, whereas by far the larger number of men moving from the West North Central States are heading toward the West Coast.

Dental officers who will be entering practice for the first time also are apparently attracted to states like California and Florida and to the far west generally. The New England and Middle Atlantic sections will also receive a high proportion of the new practitioners in relation to the civilian population. (Table 2,)

As is shown in the third column of Table 2, the southern states will receive a considerable number of new practitioners in proportion to the number of dentists who left practice to enter service. The fourth column shows that in terms of population-dentist ratios, the states of the South are not receiving an equitable share of the new dentists. These facts reflect the prewar shortage of dentists in this part of the country. Because dentists were so few, the number of new practitioners could be high in relation to former practitioners and still be low in relation to the population. That the ratio of new to former practitioners in the South is fairly high means that the newcomers will bring only moderate alleviation to the situation. As to the West and East North Central States, Table 2 follows Table 1 in that the new practitioners are not coming to these states in the numbers that they should.

In substance, these data, together with those shown in the preceding paper, point to certain decided trends in the interstate movements of dentists. About 10 per cent of all former practitioners now in service hope to go to new states.

Table 3.—Distribution of Dental Officers Changing Community of Practice According to Size of Former Location

Population of City of Prewar Practice	Population of City of Intended Practice					Number of Officers on Which Percentages Are Based*
	Less than 5,000	5,000-25,000	25,000-100,000	100,000 and Over	All Cities	
Less than 5,000	6.4	51.7	33.3	8.6	100.0	267
5,000-25,000	4.9	38.8	38.3	18.0	100.0	183
25,000-100,000	4.5	32.7	38.2	24.6	100.0	110
100,000 and over	4.7	34.8	36.7	23.8	100.0	597
Number of dental officers going to city of specified size	59	453	420	225	—	1,157

*Dental officers who entered service from private practice and who gave information on size of city of former and new community of practice.

California and Florida will attract an undue proportion of these; and the gravest loss is faced by the states in the central portions of the country.

Change of state is not the only change that may take place. Indeed, of the men previously in practice who are definitely changing communities, more than half will remain in their former states. This is more or less to be expected, since licensure presents to some a formidable problem.

A fact related to movement of dentists which is easily established, as it was through the questionnaire, is the size of community of practice. Table 3 shows the number moving from communities of different sizes, distributed according to size of city to which they are going. Thus, of the men who are changing from communities of less than 5,000 persons, 6 per cent intend going to communities of the same size, 52 per cent to communities of 5,000-25,000, 33 per cent to communities of 25,000-100,000 and 9 per cent to cities of 100,000 or more.

The data for cities of other sizes are easily obtained from the table. For the group as a whole, 44 per cent are transferring from larger to smaller cities, 23 per cent are going to cities of the same size group and 33 per cent are going to larger cities. It must be pointed out that these percentages are heavily weighted by the group in the largest cities. Fifty-two per cent of the whole group practiced originally in cities of 100,000 or more. Of these men, 76 per cent are moving to smaller cities, although only a small percentage in this group and in the other groups displayed any interest in communities of less than 5,000 population. When only the officers who had practiced in cities of less than 100,000 are considered, it is found that 68 per cent are going to larger cities and 9 per cent to smaller.

The data can be presented in another way. When the last row and last column of Table 3 are considered, it is seen that 267 dentists will leave cities of less than 5,000 population, while only fifty-nine will change to cities of this size. Similarly, 597 men are leaving cities of 100,000 and over, and 225 are coming to them. (These figures include men who are moving from one city to another of the same size.) The consequent gain will, of course, fall to the middle-sized cities, and that it is a sizable gain is readily gathered from the data in the table.

As one would expect, age and years of practice, which are directly correlated,

Table 4.—Former Practitioners Changing Community of Practice, by Year of Licensure

Year of Licensure	Number	Percentage*
	Of Former Practitioners Changing Community of Practice	
1920 or earlier	27	21.3
1921-1925	46	19.3
1926-1930	155	20.2
1931-1935	322	22.6
1936-1940	508	31.7
1941 or later	155	36.2

*Based on dental officers who are returning to practice and who gave definite reply to question of new or former locality.

are associated with the desire to change community of practice. To what extent is demonstrated in Table 4, based on definite answers of dental officers as to whether they were going to former or to new localities. A pronounced difference is to be observed between those licensed before 1936 and those licensed in 1936 or later. Of the former, about 20 per cent plan to change communities, as compared with 32 per cent among those licensed between 1935 and 1940 and 36 per cent among those licensed since 1940. A practice becomes more firmly established with the years. Those who did not find satisfaction in one locality would have had time to move on to another. The younger men have not had the same opportunity for finding a satisfactory community in which to make permanent settlement, and it is to be expected that a greater proportion of these men will seek new places.

A trend away from the smallest cities—hence, the rural areas—and away from the largest cities was also observed among the men who entered service directly from dental school or internship. This was pointed out in the preceding paper, but needs to be tied to the discussion on size of city with the observations that (1) only 5 per cent of this group specified communities of less than 5,000 population, as compared with 11 per cent in the group that came from private practice, and (2) 31 per cent of these new graduates, as compared with 40 per cent of the men from private practice, are selecting cities of 100,000 and over.

Potential Contributions to Better Distribution of Dentists

Items 31 and 32, near the end of the questionnaire, offer information that can feasibly be used in a dental health program. One problem in such a program is how best to utilize available manpower in meeting dental needs. Another is how to induce dentists to locate where they are most badly needed—in the sparsely populated areas, in areas of low economic standing. Some light on these problems is afforded by the replies.

Question 31 was: "Would you like to become associated in private practice with a group of dentists?"

Private practice on a group basis is intended to offer a method of practice whereby skill, equipment and technical and clerical assisting personnel are pooled. (The financial arrangements within the group are not of concern here. The group may or may not have a prepayment plan.) Such studies as have been made indicate that this method of practice permits the dentist to better utilize his time and to carry a greater patient load, but other difficulties attend. Further research on the question is greatly needed.

Of all the dental officers who returned questionnaires, 23 per cent answered Question 31 in the affirmative and an additional 3 per cent expressed a moiety of interest in such practice. (A few indicated that they would like to become associated with a group of physicians.) The percentage was a little higher among the men from dental school and internship (30 per cent) than in the group that entered service from private practice (25 per cent). But when age differences

are sought in the latter, none is found, the percentage in each age group being close to that for the officers from private practice as a whole.

Some differences are to be found among the men from private practice when divided according to geographic division of former practice (Table 5). Interest in group practice is lowest among the men from the southern part of the United States—the East South Central (12 per cent), West South Central (17 per cent) and South Atlantic States (23 per cent). Highest percentages occur in the Middle Atlantic States (30) and in the Mountain States (31); but, in the latter, the number on which the percentage is based is rather small.

Question 32 read: "Would you go to an area needing dentists if you were provided with: an office—a subsidy—a loan —(one or more may be checked)."

What constitutes an area needing dentists it is hard to say. Ratio of dentists to population tells only part of the story. Concentration of the population, level of health and educational attainment, transportation facilities and a host of other factors enter into an accurate evaluation of need.[1] Suffice it to say that there are many areas where the grim need for dentists cannot be questioned; and where to place men willing to go to such areas should not be a problem. This is now under study by postwar planning and other committees of state dental societies.

The findings of Question 32 were presented in two ways in the paper "General Findings." The first of two tables showed the percentage of dental officers checking each possible combination of items. The second table showed the percentage checking each of the items, alone or in combination with others. The latter table is reproduced in this paper as Table 6, with the addition of information on the percentage of dental officers who checked one or more items.

Of all the dental officers who returned questionnaires, 28 per cent said they would go to an area needing dentists if provided with one or more of the benefits specified. It is to be especially remarked that the percentage among those who came directly from dental school or internship was almost 40; while, in the group that was formerly in private practice, it was slightly less than 25. The former group has never been in practice, and very few of its members own dental outfits. They are young men without ties to former communities and offices, and many of them have the financial problem of paying for their professional education, purchasing equipment and supporting a family.

As for kind of benefit preferred, provision of an office apparently offered the strongest inducement for location in an area needing dentists. This item was checked by almost a quarter of all the men, by itself or in combination with the others. The number preferring a subsidy was twice the number preferring a loan. For many dentists, such a move would involve great monetary sacrifice, particularly at a time when even the better economic areas will have no surfeit of dentists. The contribution that these men will be making to the public

Table 5.—Former Practitioners in Each Region Interested in Group Private Practice

Geographic Division	Number	Percentage
	Of Former Practitioners Expressing Interest in Group Private Practice	
Mountain	41	31.1
Middle Atlantic	496	30.3
New England	80	25.6
Pacific	177	25.4
West North Central	169	25.1
East North Central	283	23.0
South Atlantic	71	22.8
West South Central	54	17.3
East South Central	22	12.1

1. O'Rourke, J. T.: Analysis of Number and Distribution of Active Dentists in United States, J.A.D.A., 31:1097, August 1, 1944.

Table 6.—Percentage of Dental Officers Checking Office, Subsidy or Loan

Items Checked	All Dental Officers	Status Prior to Active Service		
		Private Practice	Dental School or Internship	Salaried Position
Office	23.2	19.8	33.7	27.7
Subsidy	15.5	14.3	19.4	14.9
Loan	8.2	6.7	12.6	9.6
Percentage checking one or more items*	28.0	24.8	38.2	30.3
Number of dental officers	7,549	5,495	1,671	383

*Since officers could check more than one item, the percentages are not additive.

health in the needy areas entitles them to insurance of an adequate income, or at least assurance of maintenance until they can establish themselves.

Of the men who have been in practice, a breakdown by age shows that the interest in areas needing dentists exists predominantly among the younger men, the percentages increasing from 17 in the group 50 years and over to 28 in the group under 30 years (Table 7). The reasons are probably similar to those just hypothesized for the new graduates. An additional reason may be the more certain return of older practitioners to their former communities after the war. It is well known that many dentists in service have continued the rental of their offices and have maintained these offices through partners or assistants. This would be especially true of the older men.

It may be that most of the dental officers who are willing to go to areas in need of dentists would prefer their own sections of the country. As in the case of private group practice, it is worth while to investigate regional differences in this respect. The data are shown in Table 8. The highest percentage is to be found in the Middle Atlantic States (30.9), where the ratio of dentist to population is relatively high. In contrast, the states in the southern portions of the country, where the need for dentists is well known, show a rather low percentage (an average of 20.4). Any conclusions from this are to be tempered by the fact that many officers are returning or going to communities which they know to be sorely in need of dentists.

While the data in this paper have dealt separately with three phases of the questionnaire—the movement of dentists from community to community, interest of dental officers in group private practice and willingness of the dentist to go to areas needing dentists—they have not dealt with three different groups of men. For example, among former practitioners interested in group practice, the percentage that intends seeking a new community of practice or is undecided whether to seek a new community is 43, as compared with 27 per cent among those not interested in other than individual practice. Also, 40 per cent of the former are willing to go to areas needing dentists if provided with some kind of benefit, while, among the latter—those not interested in group practice—only 20 per cent said yes to such a move.

In short, the dental officers interested in group practice tend to be those who are changing community or are interested in areas where the need for them is strong. As individuals, they are casting

Table 7.—Former Practitioners in Different Age Groups Willing to Go to Area Needing Dentists if Provided with Office, Subsidy or Loan

Age in Years (in 1944)	Number	Percentage
	Of Former Practitioners Willing to Go to Areas Needing Dentists	
Under 30	232	28.1
30-34	489	26.5
35-39	425	23.4
40-49	194	22.0
50 and over	20	17.2
All ages*	1,363	24.8

*Includes three of unknown age.

about for some more satisfactory mode and place of practice. As a group, they offer a possible though partial solution to the problem of obtaining dentists for the areas where acute shortages of dental personnel exist.

Summary

1. Former private practitioners who hope to establish themselves in new states—about 10 per cent of all men who entered service from private practice—show definite trends toward California and the far west and toward Florida.

2. Among former practitioners who are considering a change of community, the trend is away from communities of less than 5,000 persons and, though to a lesser extent, away from cities of 100,000 population or more.

3. Thirty-six per cent of the men licensed since 1940 and 32 per cent of those licensed between 1935 and 1940 plan to change communities, as compared with 20 per cent of those licensed before 1936.

4. About one fourth of all who replied to the questionnaire indicated an interest in private practice with a group of dentists. A few would combine dentists and physicians. Age differences were not significant, but analysis by geographic division showed a range from 31 per cent for the Mountain States to 12 per cent for the East South Central States.

5. Twenty-eight per cent of all the officers replying expressed willingness to go to an area needing dentists if provided with an office, a subsidy or a loan. The percentages among the men grouped according to status before the war was as follows: from private practice, 25 per cent; from dental school or internship, 38 per cent; from full-time salaried position, 30 per cent.

6. The provision of an office was checked by 23 per cent of the men, a subsidy by 16 and a loan by 8. These percentages are not mutually exclusive.

7. Willingness to go to areas needing dentists varied inversely with age among the men who came from private practice. The percentage interested was 28 in the men under 30. Wide geographic differences were also observed, lowest percentages occurring in the three southern geographic divisions.

8. There was a notable overlapping among the men who signified a changing of community of practice, interest in group private practice and readiness to go to an area needing dentists.

Comment

Our present concern is with the po-

Table 8.—Former Practitioners in Each Region Willing to Go to Area Needing Dentists if Provided with Office, Subsidy or Loan

Geographic Division	Number	Percentage
	Of Former Practitioners Willing to Go to Areas Needing Dentists	
Middle Atlantic	505	30.9
West North Central	177	26.2
Mountain	32	24.1
East North Central	295	24.0
West South Central	67	21.5
South Atlantic	64	20.6
New England	59	18.7
East South Central	33	18.3
Pacific	126	18.1

tential contribution of the dental officer population to national dental care. The group on active duty who plan eventually to engage in private practice aggregate 20,000 men, and their separation from the armed forces will have profound consequences as regards the total distribution of dental practitioners. Their war experience may very well have given many a broadness of outlook and an awareness of the nation's health needs that will assure their active participation in a program of care.

The findings of the survey have both favorable and unfavorable aspects. By the latter is meant, first, the movement of dentists toward areas where the number of persons per practitioner is already quite satisfactory by comparison with the rest of the country; and, second, the reluctance on the part of new practitioners to enter (and of many former practitioners to reenter) practice in the more rural areas.

It should be remembered that the overcrowding of certain parts of the country and of certain communities, because of climatic or other favorable conditions, may create an economic rivalry that can result in conditions detrimental to the public health, as described by Chief Justice Charles Evans Hughes, in the famous Oregon case:

> . . . The legislature was not dealing with traders in commodities, but with the vital interest of public health, and with a profession treating bodily ills and demanding different standards of conduct from these which are traditional in the competition of the market place. The community is concerned with providing safeguards not only against deception, but against practices which would tend to demoralize the profession by forcing its members into an unseemly rivalry which would tend to enlarge the opportunities of the least scrupulous. . . ."

In other words, where economic rivalry reaches a high pitch because of the concentration of dentists, good dental health is not assured the population, and all dentists cannot practice in accordance with their high ideals and the code of ethics of the American Dental Association.

The solution to the problem of unfavorable movement of dentists lies principally in making practice attractive where the returning dental officer is needed, and in creating in him an appreciation of the needs of his home region, state and community.

Interest in practice on a group basis and willingness to go to areas in need of dentists were manifested by a large segment of the dental officer population. Although there is some overlap between those who would welcome association in practice with a group of dentists and those who would go to areas needing dentists, the two can be discussed separately.

While no precise measure has been taken of the economy of group practice in terms of patients seen, the available evidence from clinic studies demonstrates that such practice does make for a more efficient utilization of dental manpower. Certainly, a great deal of consideration and experiment are warranted, especially in connection with the quality of service rendered under such a system. The fact that a quarter of the men who replied to the questionnaire evinced an interest in this mode of practice is strong evidence of a desire for trial and new ways. In round numbers, the percentage indicates that between five and six thousand dentists in service would give consideration to an opportunity for such practice. Here is rich material, indeed, for thorough testing of a scheme of practice which may go far to overcome the manpower obstacle in a program for national dental health.

The failure of dentists to locate in the poorer and in the more sparsely settled areas of the country has impeded attainment of adequate dental care for the entire population. It is only fair to the dentist, if he sacrifices the opportunities

offered by the larger cities and the wealthy industrial areas to go to such places, that he be compensated—by the community, the state or even the nation—for his contribution to the public health and well-being.

The provision of an office, a subsidy or a loan, if effectuated, will in most cases prove little enough recompense; and yet more than a fourth of all of those who replied to the questionnaire—and almost 40 per cent of the men who entered service directly upon graduation or from internship—signified an interest in such a proposition.

To implement a procedure whereby these men can be utilized in the obtainment of a more equitable distribution of dentists is doubtless complex and difficult; but the existence of a sizable body of men whose attention has been caught by this proposal should spur to activity the leaders of the profession charged with the design of dental health programs. The good that can result is infinite.

THE EFFECTS OF DIETARY DEFICIENCIES UPON THE ORAL STRUCTURES. III.

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Carbohydrates

Carbohydrates are the primary source of energy for the body. The American people tend to consume excessive amounts of this nutritional element. Restriction in consumption of highly refined sugars in the form of sweetened beverages and candies is desirable from the standpoint of public health since they tend to displace other essential nutrients (Bing, 1942).

Most dental investigators agree that the ingestion of excessive amounts of fermentable carbohydrates accelerates the progress of dental decay (Jay, 1944; Day, 1944; Bunting, 1935). Reduction of carbohydrate intake tends, in most cases, to slow down or even arrest the progress of decay (Day, 1944). The *Lactobacillus acidophilus* count, which is a dependable indicator of caries activity, can be raised by increased ingestion of carbohydrates or lowered by a decrease in intake of carbohydrates (Becks *et al.*, 1944; Jay, 1944).

The highly refined sugars are rapidly broken down by bacteria, with production of free acid metabolites (Fosdick, 1939). The ingestion of large amounts over long periods of time results in a characteristic "sugar caries" (Miller and Neuwirth, 1935), which tends to be of a cervical type and apparently begins through a decalcifying action upon the enamel (Miller and Neuwirth, 1935).

Experimental studies suggest that an excessive intake of carbohydrates does not initiate caries, but rather increases the rate of decay already present (King, 1935; Day, Daggs and Sedwick, 1935; Lilly, 1932; Rosebury and Karshan, 1935b, 1939c; Cox, 1944).

Acid Foods.—Although acid is produced by bacterial action incident to carbohydrate degradation (Fosdick, 1939), free acid may also be ingested with foods. The presence of food acid tends to decalcify the enamel surface rather than to produce typical caries, as occurs in the carbohydrate degradation by bacteria. The local decalcifying action depends on the concentration and amount

of exposure (West and Judy, 1938; Kirkpatrick, 1939; McClure, 1943a). The buffering action of the saliva is usually sufficient to protect the enamel (Fosdick, 1942; Appleton, 1944).

The presence of citric acid in acidified candies constitutes a distinct hazard to the enamel. West and Judy (1938) found that a 40 per cent solution of one brand of lemon drops in saliva had a pH of 3.4 and dissolved 10.4 mg. of enamel in twenty-two and one-half hours. The manner in which children suck on these candies over long periods of time permits a high local concentration upon the tooth surface (West and Judy, 1938; Miller and Neuwirth, 1935).

The effect of the indiscriminate use of concentrated beverage flavors and beverages containing large amounts of citric and tartaric acids (McClure, 1943a), as well as the excessive use of lemons and lemon juice, should also be considered in respect to their decalcifying action upon the enamel (Kirkpatrick, 1939).

Acid-Base Character of the Diet.—Alveolar Bone: The excessive ingestion of foods with an acid reaction or acid ash results in a generalized acidosis and in the withdrawal of calcium salts (by resorption) from the spongy bone (Jones and Simonton, 1926). The urine becomes acid in reaction. The supporting spongiosa of the alveolar bone shows a marked resorption and osteoporosis so that the teeth become loosened (Jones and Simonton, 1926, 1928; Bauer and Haslhofer, 1938).

Caries: The possible role of acidosis or alkalosis in the production or prevention of caries is not so clear. Jones (1935) associated an excessive intake of acid ash foods with the presence of rampant decay. Kugelmass *et al.* (1934) observed an arrest in the progress of decay in children placed on an alkalizing diet.

Forshufvud (1938) produced rampant caries in rats by daily disturbances of the acid-base equilibrium of the blood by means of alternate injections of 1.5 per cent ammonium chloride and 3.0 per cent sodium bicarbonate. On the other hand, Thomas and Bodecker (1942), who repeated the experiment, were unable to observe any effect on the incidence of caries. Rosebury and Karshan (1935b) altered the acid-base balance in rats by adding citric juices and synthetic mixtures to the diet. They also found no effect on caries.

The problem of acid-base balance of the diet and acidosis or alkalosis in relation to caries needs further investigation, especially in respect to the effect upon the salivary pH. Forbes and Gurley (1932) observed changes in the acid neutralizing power of the saliva with different diets. They found that the pH of the saliva was lowered by a high cereal or high grain (acidifying) diet and raised by a high vegetable and fruit (alkalizing) diet. The relation to caries *per se* has not been studied.

Physical Character of Food

In contrast to the chemical or nutritional elements of the food which are assimilated and distributed through the blood stream, the physical character of the food is concerned with the topical effects upon the teeth and the periodontal structures and acts only in the oral cavity. The effects may be beneficial or harmful, depending on whether the foods are detergent and stimulating in action or whether they are adhesive, retained and impacted so that they undergo local decomposition. Thus, the physical character of the food, while it has no direct effect on the enamel and dentin growing within the bony jaw, constitutes an important dietary (rather than nutritional) factor in caries and periodontal disease once the teeth have erupted into the oral cavity.

Physical Character of Food and Caries.—Particle Size and Initiation of Caries: Caries can be initiated in the molars of the rat by food of a particular

particle size (60-mesh screen) which tends to impaction in pits and fissures (Hoppert, Weber and Caniff, 1931, 1932). This initiation of caries is not dependent on the nutritional elements of the diet since caries can be produced even with a diet otherwise completely adequate and can be prevented by merely changing the size of the food particles to a very coarse or very fine state, thus eliminating their impacting quality. These facts have repeatedly been verified (Lilly and Wiley, 1934; King, 1935). Rosebury (1938) explains the caries initiation as a result of the impaction, which provides a well-protected area for bacterial action upon the carbohydrates present in the food. Rosebury and Karshan (1939b) were thus able to produce caries in rats by the use of Pilot biscuit, which, they had observed, had similarly caused caries among Eskimos (Rosebury and Karshan, 1939d).

Detergent Action: The relation between the detergent and the abrasive quality of the diet and the incidence of dental caries in man has been pointed out many times (Wallace, 1929; Rosebury, 1939; Pickerill, 1924; Klatsky and Klatell, 1942; Day, 1944). Wallace (1929) points out that chewing materially aids in keeping the mouth clean. Hard, coarse and fibrous foods, which cannot be swallowed without thorough chewing, have a natural cleansing action on the tooth surface. Studies have shown that when whole citrus fruits are added to the regular diet, the bacterial count and bacterial fermentation, and therefore, by implication, caries activity, are markedly reduced (Knighton, 1942). Hewitt, Fleming and Simonton (1928) and Haydak *et al.* (1944) showed that a nondetergent or soft diet results in the rapid accumulation of epithelial and bacterial débris upon the surfaces of the teeth.

Although the bacterial count is markedly increased by this type of diet, the actual effect on caries progress is not measured.

Attrition: Klatsky and Klatell (1942) and Day (1944) point out that, in primitive peoples on a diet which caused marked attrition of the teeth, the incidence of caries is much less than in civilized peoples on a much softer diet, which requires less mastication.

Protective Action of Lipoids: Rosebury and Karshan observed that while experimental caries in the rat was not prevented or cured by additions of vitamin D to the experimental diet, the rate of progress was retarded. They believed that the protection lay partially in the vitamin-free corn oil. In 1939, they showed that vitamin-free corn oil, Wesson oil, Crisco and lard were effective in reducing the caries index. Box (1938) and McCollum *et al.* (1939) have extended these observations to man. They believe that the lipoids in the diet may form a protective mechanical coating on the teeth and thus prevent access to bacteria or their acids.

Thus, it may be concluded that the physical character of the diet is an important consideration in the problem of dental caries. It appears that caries is a problem of oral food decomposition rather than of gastro-intestinal absorption.

Physical Character of Food and Periodontal Disease.—The thorough mastication of hard foods, which is necessary, is not only detergent, but also stimulates the periodontal structures and increases the blood supply (Hill and Burwasser, 1939) and promotes hornification of the gingivae (Pelzer, 1940). Thorough chewing leads to intermittent stresses, which are transmitted to the periodontal structure and become transformed into intermittent tension forces upon the alveolar bone. The latter responds by reorganization and apposition. The use of soft and adhesive foods, on the other hand, leads to local gingival inflammation (Pelzer, 1940; Burwasser and Hill, 1939) and

such foods may serve as a nidus for calculus formation. Haydak *et al.* (1944) fed a diet consisting exclusively of cow's milk and honey to five men. A heavy white cheesy film covered the teeth and also the gums, which were hyperemic and red. They explained these findings on the basis of a lack of stimulation and mechanical cleansing normally derived from the mastication of solid food. Mead (1944) found that the daily addition of one and one-half grapefruit to a regular ration resulted in an improvement in gingival health. It is quite possible that this result is due to the local cleansing effect of the fruit in addition to the possible benefits of increased vitamin C intake. The enamel showed no decalcification or other deleterious effects.

The evidence seems to be conclusive that the use of foods in a physical state which requires thorough mastication may tend to promote oral hygiene and the health of the periodontal structures.

The use of sharp, splintery foods may be conducive to local injury, especially when the food particles become embedded in the soft tissues and act as foreign bodies. An excessive diet of oats in rabbits, guinea-pigs, rats and mice produces widespread gingival necrosis and destruction of the supporting dental apparatus (Weber, 1931; Gottlieb, 1922; Westin and Kalnins, 1938).

Diet and Dental Disease

Any analysis of the influence of the various nutritional factors on the diseases of the teeth must take into consideration the difference between the growing and the adult enamel and dentin. Hypocalcification (deficient calcification) and hypoplasia (deficient formation) of the enamel and dentin are of developmental origin and can therefore result only from nutritional disturbances occurring during tooth development. Dental caries, on the other hand, is an acquired postdevelopmental disease beginning upon the surface of the enamel and is therefore not influenced directly by nutrition, but rather through conditions present within the oral cavity. The periodontal diseases hold an intermediate position and can be influenced by both systemic and local conditions.

Dental Caries.—Dental decay is not a developmental defect, but an acquired posteruptive disease which attacks only the erupted portion of the tooth. The progress of dental caries is not influenced by the mineral content of the teeth except for fluorine (Armstrong and Brekhus, 1937). Many careful clinical investigations disprove the view that caries can be produced or prevented by altering the intake of vitamins or minerals (Day and Sedwick, 1934; Day, 1944). Disturbances in calcification (as mottled enamel or rickets) or in formation (as enamel hypoplasia) also do not play a significant role in the etiology of dental caries, but at best influence only the rate of its progress.

A balanced, adequate diet, while always indicated, is in itself no guarantee against the ravages of tooth decay (Rosebury, 1933). On the other hand, caries has frequently been absent in individuals who suffered from nutritional deficiencies (Kniesner *et al.*, 1942; Day, 1944). The low incidence of caries among native populations in different parts of the world has not been the result of any one dietary regimen (Simmonds, 1939).

In spite of these limitations in the effectiveness of a balanced diet in combating dental caries, there have been indications on the basis of clinical (Howe *et al.*, 1941; Boyd, 1943) and experimental (Rosebury, 1933) data that an adequate diet may have some influence in retarding caries. The mechanism of such partial protection against caries is not known. It is probably related to a modification of the saliva and the oral milieu—a factor which appears to be all-important in the etiology and the progress of dental caries (Box, 1938).

The local action of the food upon the tooth surface may be an essential factor in the initiation and progress of dental caries, since food stagnation and decomposition on the surface of the enamel favor bacterial activity and acid formation, especially when the fermentable carbohydrates serve as the substrate (Fosdick, 1942). Dental caries is a problem of food decomposition in the oral cavity rather than of food absorption from the gastro-intestinal tract. The physical nature of the diet may thus be more important in preventing and controlling caries than the chemical content (Day, 1944).

Present Status of Caries Research: The problem of caries is still unsolved and highly controversial (Gies, 1941). Experimental studies in animals have been complicated by the anatomic differences in the teeth of different species. Dog experiments have failed to produce caries (Mellanby, 1930). Continuously growing teeth in rodents do not decay since their rapid eruption and wear do not permit local food stagnation and impaction. Caries may occur in continuously growing teeth when retarded eruption and imperfect formation and shape permit food decomposition on the noncleansing, imperfectly abrading surfaces (Westin and Kalnins, 1938; Fish and Harris, 1935).

Clinical studies of caries for the most part have given inconclusive results because of inadequate and subjective methods of assessing caries activity and because of insufficient and inadequate controls (Cox, 1944).

Hypocalcification and Hypoplasia.—These clinical conditions are of developmental origin. The growing enamel and dentin are selective in their response to various vitamin and mineral deficiencies. Mild fluorosis will readily cause hypocalcification of the enamel without a corresponding response in the dentin. On the other hand, subclinical deficiencies in vitamin D or calcium will result in imperfect calcification of dentin without affecting the calcification of the enamel. Hypocalcification is not uncommon. Enamel hypoplasia results from permanent cell injuries and is rarely caused by nutritional deficiency alone. For example, enamel hypoplasia cannot be predicted merely on the basis of an early history of rickets, but may be expected when there is a concomitant parathyroprivic tetany.

Once produced, hypocalcification and hypoplasia are permanent and cannot be corrected by any dietary regimen. It must also be pointed out that affected teeth are no more prone to decay than are sound teeth.

The view that the depth of occlusal pits and fissures (which is an important factor in caries susceptibility) can be controlled by diet is erroneous. These structural defects are genetically determined and are the result of the fusion of the appositional growth centers established during tooth development at the relatively early stage of morphodifferentiation (Schour and Massler, 1940).

Periodontal Disease.—The nutritional status of the patient must be considered in both the diagnosis and the treatment of periodontal disease.

The periodontal tissues (gingivae, periodontal membrane, alveolar bone and cementum) grow continuously and are sensitive to both systemic and local conditions. Nutritional disturbances can affect their resistance and structure, as in the case of scurvy and pellagra; but it must be pointed out that the majority of cases are of local origin and their treatment consists of oral hygiene, local prophylaxis and the elimination of local irritants. When this treatment is ineffective, systemic conditions must be considered. In patients who reveal no obvious systemic disturbances, the possibility of a subclinical nutritional deficiency must be investigated and treatment, where indicated, given.

Summary and Conclusions

The oral structures show early and characteristic changes in response to nutritional disturbances. Nutritional studies, therefore, should include gross and histologic examination of the following structures:

1. The enamel and dentin.
2. The periodontal structures (gingivae, periodontal membrane and alveolar bone).
3. The tongue.
4. The lips.
5. The oral mucosa.

The type of response varies with the particular dental or oral structure; its stage of development, with the specific nutritional disturbance and with the species studied.

The growing and calcifying enamel and dentin afford a kymographic biologic record of the nutritional status and are especially sensitive to alterations in the calcium, vitamin A, C and D and fluorine content of the blood.

The fully formed and calcified enamel and dentin are no longer influenced by calcium metabolism. Their condition constitutes the nutritional record of the past. The completed enamel is exposed to the oral fluids and oral flora and is no longer subject to systemic nutritional influences. It is essentially devoid of an internal environment and is influenced by systemic conditions only to the extent that the oral milieu may be modified through changes in the saliva.

The soft oral structures—the oral mucosa, the tongue, the lips, the gingivae and the periodontal membrane—which grow throughout life reflect the nutritional status of the present in both the young and the old and are especially sensitive to vitamin B, A and C deficiencies.

The alveolar bone, which also grows throughout life, responds particularly to disturbances in mineral metabolism and offers the advantage of roentgenographic examination.

Our knowledge of the effect of nutritional disturbances on the oral structures is derived from both experimental and clinical observations.

Most of the evidence regarding the delicate response of tooth development to nutritional disturbances is derived from animal experimentation, especially on the rodent. Their incisors are of continuous growth and are ideal for the analysis of growth, calcification and eruption.

Where clinical data are not available, it cannot be assumed that the oral structures in man are equally sensitive, either qualitatively or quantitatively. There are considerable anatomic and physiologic differences in the dental apparatus of the rat, guinea-pig, dog and other species.

The findings on the response of the soft oral tissues are derived largely from clinical observations in man. This is especially true of the effects of vitamin B deficiency. The experimental and microscopic oral changes in this deficiency await further investigation.

Present evidence has not established a specific nutritional basis for caries or for periodontal disease. Dental disease may be caused or aggravated by nutritional deficiencies and, in such cases, cannot be treated successfully unless the nutritional condition is recognized and corrected.

The physical character of the food, through its cleansing action on the enamel surface and its stimulating action on the gingivae, is a significant dietary factor in caries and periodontal disease.

Caries is largely a problem of oral food decomposition rather than of gastrointestinal food absorption.

The effects of protein, fat and carbohydrate ingestion upon the teeth and surrounding tissues merit further investigation.

Routine examination of the oral structures offers an accurate index to the state of nutrition.

Bibliography

Abels, J. C.; Rekers, P. E.; Hayes, M., and Rhoads, C. P.: Relationship Between Dietary Deficiency and Occurrence of Papillary Atrophy of Tongue and Oral Leukoplakia. Cancer Res. 2:381, June 1942.

Anderson, B. G.; Smith, A. H.; Arnim, S. S., and Orten, A. U.: Changes in Molar Teeth and Their Supporting Structures of Rats Following Extraction of Upper Right First and Second Molars. Yale J. Biol. & Med. 9:189, December 1936.

Appleton, J. L. T.: Bacterial Infection with Special Reference to Dental Practice. Ed. 3 Philadelphia: Lea & Febiger, 1944.

Armstrong, W. D., and Brekhus, P. J.: Chemical Constitution of Enamel and Dentin. J. Biol. Chem. 120:677, Sept. 1937.

Armstrong, W. D.: Biochemical and Nutritional Studies in Relation to Teeth. Ann. Rev. Biochem. 11:441, 1942.

Armstrong, W. D.: Review of Dental Fluorosis Studies at University of Minnesota; in F. R. Moulton's Fluorine and Dental Health, Pub. 19, A.A.A.S., Washington, 1942.

Arnim, S. S.; Clarke, M. F.; Anderson, B. G., and Smith, A. H.: Dental Changes in Rats Consuming Diet Poor in Organic Salts. Yale J. Biol. & Med. 9:117, October 1936.

Anschoff, L., and Koch, W.: Skorbut. Jena: Gustav Fischer, 1919.

Bauer, Wilhelm, and Haslhofer, L.: Veranderung der Kiefer und Zahne durch Zuckerverabreichung. Ztschr. Stomatol. 31:1359, Nov. 1933.

Bean, W. B.; Spies, T. D. and Blankenhorn, M. A.: Secondary Pellagra. IV. Diseases of Alimentary Canal (Mouth and Throat). Medicine 23:1, Feb. 1944.

Becks, Hermann, and Ryder, W. B.: Experimental Rickets and Calcification of Dentin. Arch. Path. 12: 338, September 1931.

Becks, Hermann, and Weber, M.: Influence of Diet on Bone System with Special Reference to Alveolar Process and Labyrinthine Capsule. J.A.D.A. 18:197, February 1931.

Becks, Hermann, and Simmonds, Nina: Dental Caries and Paradontal Disturbances. I. Importance of Adequate Diet for Health of Teeth and Paradentium. J.A.D.A. 22:1724, October 1935.

Becks, Hermann, and Furuta, W. J.: Effects of Magnesium Deficiency Diets on Oral and Dental Tissues. I. Changes in Enamel Epithelium. J.A.D.A. 26:883, June 1939.

Becks, Hermann, and Furuta, W. J.: Effects of Magnesium Deficient Diets on Oral and Dental Tissues. II. Changes in Enamel Structure. J.A.D.A. 28:1083, July 1941.

Becks, Hermann, and Furuta, W. J.: Effects of Magnesium Deficient Diets on Oral and Dental Structures. III. Changes in Dentin and Pulp Tissue. Am. J. Orthodontics 28:1, January 1942.

Becks, Hermann, and Morgan, A. F.: Effect of Deficiencies of Filtrate Fraction of Vitamin B Complex and of Nicotinic Acid on Teeth and Oral Structures. J. Periodontol. 13:18, January 1942.

Becks, Hermann: Dangerous Effects of Vitamin D Overdosage on Dental and Paradental Structures. J.A.D.A. 29:1947, November 1, 1942.

Becks, Hermann; Wainwright, W. W., and Morgan, A. F.: Comparative Study of Oral Changes in Dogs Due to Deficiencies of Pantothenic Acid, Nicotinic Acid and Unknowns of B Vitamin Complex. Am. J. Orthodontics 29:183, April 1943.

Becks, Hermann; Jensen, A. L., and Milarr, C. B.: Rampant Dental Caries: Prevention and Prognosis. Five Year Clinical Survey. J.A.D.A. 31:1189, September 1, 1944.

Besney, O. H., and Wolbach, S. B.: Vitamin A Physiology and Pathology. J.A.M.A. 110:2072, June 18, 1938.

Bevelander, G., and Hoskins, M. M.: Comparison Between Dietary and Hormonal Factors in Development of Dentin. J. D. Res. 18:533, December 1939.

Blackberg, S. N., and Berke, J. D.: Effects of Ante-natal and Post-natal Deficiency of Vitamin D on Animal Dentition. J. D. Res. 12:349, April 1932.

Blackberg, S. N., and Berke, J. D.: Histopathologic and Radiographic Study of Teeth of Dogs Fed a Rachitogenic Diet. J. D. Res. 16:443, October 1937.

Bloch, C. E.: Vitamin A Deficiency and Dental Anomalies in Man. Acta. Paediat. 11:536, August 1930.

Bloch, C. E.: Effects of Deficiency in Vitamins in Infancy. Am. J. Dis. Child. 42:263, August 1931.

Blockley, C. H., and Baenziger, P. E.: Investigation into Connection Between Vitamin C Content of Blood and Periodontal Disturbances. Brit. D. J. 73:57, August 1, 1942.

Box, H. K.: Liquefying Amylase in Human Saliva, Amylopectin, and Dental Caries. Bull. No. 24 Canad. D. Res. Found., December 1938.

Boyd, J. D.: Long Term Prevention of Tooth Decay Among Diabetic Children. Am. J. Dis. Child. 66:349, October 1943.

Boyle, P. E.: Manifestations of Vitamin A Deficiency in Human Tooth Germ. J. D. Res. 13:39, February 1933.

Boyle, P. E.: Tooth Germ in Acute Scurvy. J. D. Res. 14:172, June 1934.

Boyle, P. E.: Effect of Ascorbic Acid Deficiency on Enamel Formation in Teeth of Guinea-Pigs. Am. J. Path. 14:843, November 1938.

Boyle, P. E.; Wolbach, S. B., and Bessey, O. A.: Histopathology of Teeth of Guinea Pigs in Acute and Chronic Vitamin C Deficiency. J. D. Res. 15:331, March 1936.

Boyle, P. E.; Bessey, O. A., and Wolbach, S. B.: Experimental Production of Diffuse Alveolar Bone Atrophy Type of Periodontal Disease by Diets Deficient in Ascorbic Acid (Vitamin C). J.A.D.A. 24:1768, November 1937.

Boyle, P. E.; Bessey, O. A., and Wolbach, S. B.: Experimental Alveolar Bone Atrophy Produced by Ascorbic Acid Deficiency and Its Relation to Pyorrhea Alveolaris. Proc. Soc. Exper. Biol. & Med. 36:733, June 1937.

Boyle, P. E.; Bessey, O. A., and Howe, P. R.: Rate of Dentin Formation in Incisor Teeth of Guinea-Pigs on Normal and on Ascorbic Acid-Deficient Diets. Arch. Path. 30:90, July 1940.

Boyle, P. E., and Wesson, L. G.: Influence of Vitamin D on Structure of Teeth and of Bones of Rats on Low Calcium Diets. Arch. Path. 36:243, September 1943.

Brekhus, P. J.: Your Teeth. Minneapolis: University of Minnesota Press, 1941.

Brinch, O.: Dentale und Paradentale Gewebsveranderungen bei Skorbut. Paradentium 9:121, June 1937.

Bunting, R. W.: Diet and Dental Caries. J.A.D.A. 22:114, June 1935.

Burket, L. W., and Hickman, G. O.: Oral Herpes (Simplex) Manifestations; Treatment with Vitamin B Complex. J.A.D.A. 29:411, March 1942.

Burn, C. G.; Orten, A. U., and Smith, A. H.: Changes in Structure of Developing Tooth in Rats Maintained on Diets Deficient in Vitamin A. Yale J. Biol. & Med. 13:817, July 1941.

Burrill, D. Y.: Relationship of Blood Plasma Vitamin C Level to Gingival and Periodontal Disease. J. D. Res. 21:355, August 1942.

Burwasser, P., and Hill, T. J.: Effect of Hard and Soft Diets on Gingival Tissues of Dogs. J. D. Res. 18:389, August 1939.

Campbell, H. G., and Cook, R. P.: Incidence and Treatment of "Gingivitis" at Dundee Dental Hospital. Brit. D. J.; 72:213, May 1, 1942.

Chapman, O. D., and Harris, A. E.: Oral Lesio[illegible]

Associated with Dietary Deficiencies in Monkeys. J. Infec. Dis. 69:7, July 1941.

Chittenden, R. H., and Underhill, F. R.: Production in Dogs of Pathological Condition Which Closely Resembles Pellagra. Am. J. Physiol. 44:13, August 1, 1917.

Clarke, M. F., and Smith, T. H.: Effect of Diet Poor in Salts upon Growth and Composition of Incisors of Rat. Am. J. Physiol. 112:286, June 1935.

Cleckley, H. M.; Sydenstricker, V. P., and Geeslin, L. E.: Nicotinic Acid in Treatment of Atypical Psychotic States Associated with Malnutrition. J.A.M.A. 112:2107, May 27, 1939.

Collins, R. O.; Jensen, A. L., and Becks, Hermann: Study of Caries-Free Individuals. II. Is Optimum Diet or Reduced Carbohydrate Intake Required to Arrest Dental Caries? J.A.D.A. 29:1169, July 1, 1942.

Council on Foods and Nutrition, American Medical Association: Some Nutritional Aspects of Sugar, Candy and Sweetened Carbonate Beverages. J.A.M.A. 120: 763, November 7, 1942.

Cox, G. J.: Critique of Etiology of Dental Caries, in Vitamins and Hormones. Vol. 2. New York: Academic Press, 1944.

Crandon, J. H.; Lund, C. C., and Dill, D. B.: Experimental Human Scurvy. New England J. Med. 223:353, September 5, 1940.

Dalldorf, G., and Zall, C.: Tooth Growth in Experimental Scurvy. J. Exper. Med. 52:57, July 1930.

Davies, A. W., and Moore, T.: Interaction of Vitamins A and E. Nature. 147:793, June 28, 1941.

Day, C. D. M.: Effect of Antiscorbutic Deficiency on Pregnant Organism and Dental Tissues. J.A.D.A. 20:1745, October 1933.

Day, D. G. M.; and Sedwick, H. J.: Fat-Soluble Vitamins and Dental Caries in Children. J. Nutrition 9:309, September 1934.

Day, C. D. M., and Shourie, K. M.: Effect of Vitamin C on Gingival and Periodontal Disease in Indian Children. Ind. J. M. Res. 31:153, October 2, 1943.

Day, C. D. M.: Nutritional Deficiencies and Dental Caries in Northern India. Brit. D. J. 76:115, March 3, 1944.

Dean, H. T.: Chronic Endemic Dental Fluorosis (Mottled Enamel). J.A.M.A. 107:1269, October 17, 1936.

Dean, H. T.: Investigation of Physiologic Effects of Dental Fluorosis by Epidemiological Method; in F. R. Moulton's Fluorine and Dental Health, Pub. 19 of A.A.A.S., Washington, 1942.

Dean, H. T.: Domestic Water and Dental Caries. J. Am. Water Works A. 35:1161, September 1943.

Dean, H. T.: Post-War Implications of Fluorine and Dental Health. Epidemiological Aspects. Am. J. Pub. Health 34:133, February 1944.

DeEds, Floyd: Factors in Etiology of Mottled Enamel. J.A.D.A. 28:1804, November 1941.

Denton, J.: Study of Tissue Changes in Experimental Black Tongue of Dogs Compared with Similar Changes in Pellagra. A. J. Path. 4:341, July 1928.

Downs, W. G.: Plasticity of Calcified Tissues. II. Results of Minor Variations in Calcium-Phosphorus-Vitamin D Complex. J. D. Res. 12:363, April 1932.

Duckworth, J., and Godden, W.: Influence of Diets Low in Magnesium upon Chemical Competition of Incisor Tooth of Rat. J. Physiol. 99:1, December 20, 1940.

Eddy, W. H.: Diet and Dentition. D. Cosmos 73:346, April 1931.

Eddy, W. H., and Dalldorf, G.: Avitaminoses. Chemical, Clinical and Pathological Aspects of Vitamin Deficiency Diseases. Ed. 2. Baltimore: Williams & Wilkins Co., 1941.

Ellenberg, M., and Pollack, H.: Pseudo-Avitaminosis Flavinosis. J.A.M.A. 119:790, July 4, 1942.

Elvehjem, C. A.; Madden, R. J.; Strong, F. M., and Wooley, D. W.: Isolation and Identification of Anti-Black Tongue Factor. J. Biol. Chem. 123:137, March 1938.

Erdheim, J.: Rachitis und Epithelkorperchen. Denkschr. d. k. Akad. d. Wissensch. math. naturw. Klasse 90:363, 1914.

Field, H.; Parnall, C., and Robinson, W. D.: Pellagra in Average Population of Northern States. New England J. Med. 223:307, August 29, 1940.

Finn, S. B., and Hodge, H. C.: Reduction in Experimental Rat Caries by Fluorine. J. Nutrition 22: 225, September 1941.

Fish, E. W.: Experimental Investigation of Enamel, Dentin and Dental Pulp. London: John Bale, Sons and Danielsson, Ltd., 1933.

Fish, E. W., and Harris, L. J.: Effects of Vitamin C Deficiency on Tooth Structure in Guinea-Pigs. Phil. Tr. Roy. Soc. 223B:489, May 28, 1934.

Fish, E. W.: Effect of Vitamin D on Calcium Content of Dentin. J. Physiol. 84:272, June 18, 1935.

Fish, E. W., and Harris, L. J.: Effects of Vitamin C Deficiency on Tooth Structure in Guinea-Pigs. Brit. D. J. 58:3, January 1, 1935.

Florestano, H. J.; Elliott, M. A., and Faber, J. E., Jr.: Effect of Citrus Juice and Various Mouth Prophylaxes on Oral Flora and Saliva. J. Bacteriol. 41: 605, May 1941.

Follis, R. H., Jr.; Jackson, D.; Eliot, M. M., and Park, E. A.: Prevalence of Rickets in Children Between Two and Fourteen Years of Age. A. J. Dis. Child. 66:1, July 1943.

Forbes, J. C., and Gurley, W. B.: Effect of Diet on Acid-Neutralizing Power of Saliva. J. D. Res. 12: 637, August 1932.

Forshufvud, S.: La Carie Dentaire Chez le Rat Blanc Comme Consequence des Troubles Provoques dans les Conditions Acidobasiques de l'Organisme. Acta. Paediat. 20:409, 1938.

Fosdick, L. S.: Carbohydrate Degradation by Mouth Organisms. I. J.A.D.A. 26:415, March 1939.

Fosdick, L. S.: Etiology and Control of Dental Caries. J.A.D.A. 29:2132, December 1, 1942.

Fraser, H. F.: Chronic Deficiency of (1) Calcium, (2) Vitamin C, and (3) Both Calcium and Vitamin C in Monkeys. Pub. Health Rep., 57:959, June 26, 1942.

Fraser, H. F., and Topping, N. H.: Mouth Lesions in Monkeys Associated with Chronic Deficiency of (1) Calcium, (2) Vitamin C and (3) Both Calcium and Vitamin C. Pub. Health Rep. 57:968, June 26, 1942.

Fridericia, L. S., and Gudjonsson, S. V.: Effect of Vitamin A Deficiency on Rate of Growth of Incisors of Albino Rats. Biol. Meddelelser 13, 2, 1936.

Friel, S.: Effect of War Diet on Teeth and Jaws of Children of Vienna, Austria. Internat. J. Orthodontia 8:539, September 1922.

Gagnon, J. A.: Effect of Magnesium Deficient Diet on Teeth and Investing Tissues of Albino Rat. M. S. Thesis, Graduate School, University of Illinois, 1940.

Gagnon, J. A.; Schour, I., and Patras, M. C.: Effect of Magnesium Deficiency on Dentin Apposition and Eruption in Incisor of Rat. Proc. Soc. Exper. Biol. & Med. 49:662, April 1942.

Gaunt, W. E.: Irving, J. T., and Thomson, W.: Calcium and Phosphorus Deficiencies in Poor Human Dietary. Brit. Med. J. 1:770, April 9, 1938.

Gaunt, W. E.; Irving, J. T., and Thomson, W.: Long-Term Experiment with Rats on Human Dietary. II. Calcium and Phosphorus Depletion and Replacement. J. Hyg. 39:91, March 1939.

Gaunt, W. E., and Irving, J. T.: Influence of Ca and P Intake on Tooth Formation. Proc. Physiol. Soc. J. Physiol. 95:518, March 11, 1939.

Gerstenberger, H. J.: Etiology and Treatment of Herpetic (Aphthous and Aphtho-Ulcerative) Stomatitis and Herpes Labialis. Am. J. Dis. Child. 26:309, October 1923.

Gies, W. J.: Dental Caries. Ed. 2. Chicago: A. D. A., 1941, p. 277.

Gottlieb, Bernhard: Rachitic and Enamel Hypoplasia. D. Cosmos 62:1209, October 1920.

Gottlieb, B.: Die Paradentalpyorrhoe der Rattenmoelaren. Vrtjsschr. f. Zahnheilk. 38:273, 1922.

Govier, W. M., and Greig, M. E.: Prevention of Oral Lesions in B_1 Avitaminotic Dogs. Science 98:216, September 3, 1943.

Grandison, W. B.; Scott, L. B., and Cruickshank, D. B.: Investigation into Influence of Synthetic Vitamin C as Controlling Factor in Incidence of Dental Caries in Already Calcified Teeth. Brit. D. J. 72:237, May 15, 1942.

Green, H. N., and Mellanby, Edward: Vitamin A as Antiinfective Agent. Brit. M. J. 2:691, October 20, 1928.

Greenwood, D. A.: Fluoride Intoxication. Physiol. Rev. 20:582, October 1940.

Harman, M. T.; Kramer, M. M., and Kirgis, H. D.: Lack of Vitamin C in Diet and Its Effect on Jaw Bones of Guinea-Pigs. J. Nutrition 15:277, March 1938.

Harris, L. J., and Innes, J. R. M.: Mode of Action of Vitamin D; Studies on Hypervitaminosis D; Influence of Calcium-Phosphate Intake. Biochem. J. 25:367, 1931.

Haydak, M. H.; Vivino, A. E.; Boehrer, J. J.; Bjorndahl, O., and Palmer, L. S.: Clinical and Biochemical Study of Cow's Milk and Honey as Essentially Exclusive Diet for Adult Humans. J. M. Sc. 207:309, February 1944.

Herlitz, C. W.: Investigations of C Vitamin Standard in Healthy Children and in Children Suffering from Gingivitis. (Preliminary Communication), Acta. Paediat. 24:341, 1939.

Hertz, J.: On Constructive and Destructive Processes in Bones and Teeth of Normal and Scorbutic Organisms. Acta. Path. Microbiol. Scand. 13: (Suppl. 28) 329, 1936.

Hess, A. F.: Rickets, Including Osteomalacia and Tetany. Philadelphia: Lea & Febiger, 1929.

Hirschfeld, Isadore: Scurvy: Report on Three Cases in Adults. J.A.D.A. 16:796, May 1929.

Hoffman, M. M.; Schucks, C., and Furuta, W. J.: Histologic Study of Effects of Fluorine Administered in Dry and Moist Diets on Teeth of Young Albino Rat. J. D. Res 21:157, April 1942.

Hojer, J. A.: Scurvy. Acta. Paediat. (Supp.) 3:8, 1924.

Hoppert, C. A.; Webber, P. A., and Canniff, T. L.: Production of Dental Caries in Rats Fed Adequate Diet. Science 74:77, July 17, 1931.

Hoppert, C. S.; Webber, P. A., and Canniff, T. L.: Production of Dental Caries in Rats Fed on Adequate Diet. J. D. Res. 12:161, February 1932.

Hou, H. S.: Riboflavin Deficiency Among Chinese. II. Cheilosis and Seborrheic Dermatitis. Chinese M. J. 59:314, April 1941.

Howe, P. R.; Wesson, L. G.; Boyle, P. E., and Wolbach, S. B.: Low Calcium Rickets in Guinea-Pig. Proc. Soc. Exper. Biol. & Med., 45:298, October 1940.

Howe, P. R.; Bessey, O. A., and White, R. L.: Practical Nutritional Suggestions for Dentists. J.A.D.A. 28:1089, July 1941.

Howe, P. R.; White, R. L., and Elliott, M. D.: Influence of Nutritional Supervision on Dental Caries. J.A.D.A. 29:38, January 1942.

Howitt, B. F.; Fleming, W. C., and Simonton, F. V.: Study of Effects upon Hygiene and Microbiology of Mouth of Various Diets, Without and with Use of Toothbrush. D. Cosmos 70:575, June 1928.

Irving, J. T., and Richards, M. B.: Influence of Age upon Requirement of Vitamin A. Nature 144: 908, November 25, 1939.

Irving, J. T.: Influence of Diets Low in Magnesium on Histologic Appearance of Incisor Tooth of Rat. J. Physiol. 99:8, December 1940.

Irving, J. T.: Some Nutritional Factors in Tooth Calcification. S. African D. J. 15:2, January 1941.

Irving, J. T.: Influence of Vitamin D upon Incisor Teeth of Rachitic Rats. Nature 147:608, May 17, 1941.

Irving, J. T.: Enamel Organ of Rat's Incisor Tooth in Vitamin E Deficiency. Nature 150:129, July 25, 1942.

Irving, J. T.: Effect of Simultaneous Vitamin A and Vitamin D Deficiency on Dentine of Incisor Tooth of Rat. D. Rec. 63:281, December 1943.

Irving, J. T.: Action of Sodium Fluoride on Dentin and Predentin of Incisor Teeth of Rats Consuming Diets Containing Calcium and Phosphorus in Various Ratios. J. D. Res. 23:447, December 1943.

Irving, J. T.: Action of Vitamin D upon Incisor Teeth of Rats Consuming Diets with High or Low Ca:P Ratio. J. Physiol. 103:9, June 15, 1944.

Jay, Philip: Nutrition and Dental Caries. J. New Jersey D. Soc. 15:20, January 1944.

Jeghers, H.: Nutrition: Appearance of Tongue as an Index of Nutritional Deficiency. New England J. Med. 227:221, August 6, 1942.

Jeghers, H.: Riboflavin Deficiency. IV. Oral Changes. Advances in Internal Medicine I. New York: Interscience Publishers Inc., p. 257, 1942.

Jolliffe, N.; Fein, H. D., and Rosenblum, L. A.: Riboflavin Deficiency in Man. New England J. Med. 221:921, December 1939.

Jolliffe, N.; Bowman, K. M.; Rosenblum, L. A., and Fein, H. D.: Nicotinic Acid Deficiency Encephalopathy. J.A.M.A. 114:307, January 27, 1940.

Jones, H. E.; Green, H. F.; Armstrong, T. G., and Chadwick, V.: Stomatitis Due to Riboflavin Deficiency. Lancet 1:720, June 3, 1944.

Jones, Martha R., and Simonton, F. V.: Changes in Alveolar Process About Teeth in Dogs on Experimental Diets. Proc. Soc. Exper. Biol. & Med. 23:734, May 1926.

Jones, Martha R., and Simonton, F. V.: Mineral Metabolism in Relation to Alveolar Atrophy in Dogs. J.A.D.A. 15:881, May 1928.

Jones, Martha R.: Studies on Inorganic Salt Metabolism; Effect of Faulty Diet on Dentition of Brood Bitches, and Dental and Skeletal Development of their Offspring. J. D. Res. 10:281, June 1930.

Jones, Martha R.; Larson, N. P., and Pritchard, G. P.: Dental Disease in Hawaii; Relationship Between Bone and Tooth Development in Infants. Am. J. Dis. Child. 45:789, April 1933.

Jones, Martha R.: Our Changing Concept of "Adequate" Diet in Relation to Dental Disease. D. Cosmos 77:535, June; 631, July; 747, August 1935.

Jump, E. B.: Changes Within Mandible and Teeth in Case of Rickets. Am. J. Orthodontics 25:484, May 1939.

Jundell, I., and Berlin, V.: Nutritional State and Caries. Acta Paediat. 26:226, 1939.

Kalnins, V.: Wirkung der Ascorbinsaure auf die Zahne und den Kieferknochen skorbutischer Meerschweinschen. Upsala laker. förh. 45:117, October 31, 1939.

Karshan, Maxwell: Calcification of Teeth and Bones on Rachitic and Nonrachitic Diets. J. D. Res. 13:301, August 1933.

Karshan, Maxwell, and Rosebury, Theodor: Correlation of Chemical and Pathological Changes in Teeth and Bones on Rachitic and Non-Rachitic Diets. J. D. Res. 13:305, August 1933.

Kaufman, W.: Common Form of Niacin Amide Deficiency Disease: Aniacinamidosis. New Haven; Yale University Press, 1943.

Kent, B. S.: Necrotic Gingivitis. Lancet 1:642, May 20, 1943.

Kesel, R. G.: Dental Caries: Etiology, Control and Activity Tests. J.A.D.A. 30:25, January 1943.

Key, K. M., and Elphick, G. K.: Quantitative Method for Determination of Vitamin C. Biochem. J. 25:[illegible], 1931.

[illegible] G.; Musulin, R. R., and Swanson, W. F.: Effect of Vitamin C Intake upon Degree of Tooth Injury Produced by Diphtheria Toxin. Am. J. Pub. Health 30:1068, September 1940.

(To be continued)

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August 1 EDITORIALS 1945

THE OTHER HALF OF THE PICTURE

The use of four per cent procaine solutions, while they may be desirable in occasional instances as local anesthetics, definitely cannot be recommended for routine, everyday employment in dental practice. The use of such unnecessarily potent solutions violates the pharmacologic axiom that the smallest amount of a drug necessary to a desired effect is the largest amount that should be used. The practice of using these strong solutions routinely to bolster defective technics of injection cannot be justified. Additionally, the routine use of these strong solutions places the operator's supposed ease and convenience above the patient's well-being, for there is sound evidence to support the viewpoint that toxicity is not a negligible factor in local anesthetic agents.[1]

Two per cent procaine or 1 per cent monocaine solutions have been used millions of times and they meet most of the needs of dental practice for safe and effective local anesthesia. The Council on Dental Therapeutics of the American Dental Association has supported this view in many reports.[2] It has also found four per cent

1. Bieter, R. N.: Applied Pharmacology of Local Anesthetics. Am. J. Surg. 34:500-510, December 1936.

2. Preliminary Report on Monocaine Hydrochloride. J.A.D.A. 26:1889, November 1939; the Present Status of Monocaine Hydrochloride. Ibid. 31:1674, December 1, 1944; Contributions to Higher Professional Standards—Council on Dental Therapeutics. Ibid. 31:741, June 1, 1944; Local Anesthetic Solutions Intended for Injection. Ibid. 31:818, June 1, 1944; Preliminary Report on Novocain-Pontocaine-Cobefrin Solution, R. B. Waite. Ibid. 29:2247, December 1, 1942; Council Declares Novocain-Pontocaine-Cobefrin Not Acceptable for "Accepted Dental Remedies." Ibid. 32:494, April 1, 1945.

procaine solutions not acceptable for inclusion in Accepted Dental Remedies.[3]

Although the use of strong local anesthetic solutions is not new, there now exists a definite campaign to exploit these products to the profession for routine use. Recently, several commercial firms, particularly the Cook-Waite Laboratories and the Novocol Chemical Manufacturing Company, have issued "educational" literature which shows only one half of the picture. One brochure in particular, beautifully produced in spite of wartime paper shortages that affect valuable publications very seriously, has undertaken to support higher concentrations in local anesthetic solutions by numerous quotations from the literature. Novocain (Procaine HCl) and Pontocaine (Tetracaine HCl) are made to appear so harmless that their use in almost any quantity would seem to be easily justified. A study of literature not cited by the firm reveals that some of the evidence pertinent to this important subject has been ignored.

Goodman and Gilman,[4] in commenting on the toxicity of local anesthetics, say, "Although procaine is the least toxic of all local anesthetics, it sometimes causes systemic effects in unusually sensitive individuals. Deaths have been reported from the injection of as little as 0.01 to 0.13 gram of procaine. Such responses are probably due to idiosyncrasy and fortunately are rare. Death is usually characterized by cardiovascular collapse and occurs immediately following the administration of procaine." This is one of the drugs the firm so glibly absolves of harmful potentialities. With regard to pontocaine, Sollmann[5] states that "its toxicity upon injection is ten times greater than procaine." Beutner and Calesnick[6] report: "Pontocaine is the most active convulsant of all local anesthetics as far as we know, being about twenty times more toxic than procaine, and three times more so than cocaine." Apparently the copywriter for Cook-Waite Laboratories was not sufficiently interested in the opinions of outstanding pharmacologists to report their published statements.

Dermatitis following the use of pontocaine is reported in the literature, and the more serious hazards of convulsions and death are cited by various workers. Hansen and Stealy[7] report a death following the use of tetracaine (pontocaine) as a gargle anesthetic. Thomas and Fenton[8] comment on four cases of fatal reactions to the topical application of pontocaine. Derbes and Engelhardt[9] report two deaths following the use of a pontocaine spray, while McAlpine and Berens[10] cite eleven reports of hypersensitiveness to pontocaine. The latter also report four new cases of dermatitis among ophthalmologists and three cases in patients. Patch tests for pontocaine gave a positive reaction in six of all of the seven cases. Procaine, though markedly less

3. Four Per Cent Procaine Solutions—Not Acceptable for "Accepted Dental Remedies." J.A.D.A. 31:278, February 1, 1944.

4. Goodman, Louis, and Gilman, Alfred: Pharmacological Basis of Therapeutics. New York: Macmillan Co., 1940, p. 298.

5. Sollmann, Torald: Manual of Pharmacology. Ed. 6. Philadelphia: W. B. Saunders Co., 1942, 325.

6. Beutner, R., and Calesnick, B.: Essential Characteristics of Local Anesthetics. Anesthesiology. 3:673, November 1942.

7. Hansen, F. M., and Stealy, C. L.: Tetracain—Sudden Death Following Use as a Gargle Anesthestic for Gastroscopic Examination. Rev. Gastroenterol. 10:212, July-August 1943.

8. Thomas, J. W., and Fenton, M. M.: Fatalities and Constitutional Reactions Following Use of Pontocaine. J. Allergy. 14:145, November 1942.

9. Derbes, V. J., and Engelhardt, H. T.: Deaths Following Use of Local Anesthetics in Transcricoid Therapy: Critical Evaluation. J. Lab. & Clin. Med. 29:478, May 1944.

10. McAlpine, P. T., and Berens, Conrad: Allergic Dermatitis and Blepharoconjunctivitis Caused by Pontocaine. Am. J. Ophthalmol., Series 3, 25:206, February 1942.

toxic than pontocaine, also has its hazards. Hansen[11] recently reported a death following the infiltration of procaine hydrochloride.

This evidence is too impressive to be overlooked by those dentists who wish to weigh every hazard or by those who wish to avoid the indiscriminate use of potentially harmful agents. Monocaine HCl, 1.5 per cent, with epinephrine 1:100,000, the safety of which has been advertised by the Novocol Chemical Manufacturing Co., cannot be recommended for routine dental anesthesia. The dentist should not overlook the unrefuted findings of Schamp, Schamp and Tainter[12] in regard to the cardiovascular toxicity of monocaine HCl. The similar Novocain-Pontocaine-Cobefrin solution, which contains two local anesthetics, should be used with particular discrimination. Patients of dentists who are sensitive to either procaine or tetracaine (pontocaine) may be adversely affected and the use of either drug may be the cause of dermatitis or cardiovascular collapse.

In those relatively few cases wherein higher concentrations of local anesthetic solutions are advisable, a 3 per cent procaine solution with epinephrine 1:50,000 or 1:60,000 should give satisfactory results with a reasonable margin of safety.

Local anesthetic agents have too great an importance in dentistry to be tossed about by every promotional whim and fancy. The Council on Dental Therapeutics of the American Dental Association was established in order to protect dentists and their patients against this type of exploitation.

THE RESEARCH AND GRANTS-IN-AID BILLS
(S. 190 and S. 1099)

Two bills that will give a tremendous impetus to the development of a sound national program for dental health were given a hearing June 26-28 before a subcommittee of the Senate Committee on Education and Labor. Both of these bills are sponsored by the American Dental Association, whose three-point plan for improved dental health will be translated into reality by this legislation.

The first bill provides federal funds for the erection and equipment of a national institute of dental research comparable to the National Cancer Institute. The bill also provides for grants-in-aid for dental research to other public and private agencies. The second bill, which is patterned after similar legislation for the control of tuberculosis and venereal diseases, makes federal funds available to the states for experimental programs in dental health education and dental care. An advisory council, a majority of whose members shall be dentists, is established by each bill to aid in the direction of the program.

The long-standing need for such legislation was readily apparent in the testimony* given by many witnesses at the hearings. Not a single statement was read in opposition to the objectives of the two bills although several proposals were made for their amendment in certain particulars. In addition to the representatives of the American Dental Association who testified in favor of the bills were: the Surgeon General of the United States Public Health Service, representatives from the Na-

11. Hansen, J. L.: Death from Procaine Hydrochloride, in Connection with Infiltration of Procaine Hydrochloride into Stellate Ganglion. Ugeskr. f. Laeger. 103:159, February 1941; via J.A.M.A. 117:492, August 9, 1942.

12. Schamp, J. R.: Schamp, H. M., and Tainter, M. L.: Pharmacological Effects of Monocaine Hydrocholoride. Anesthesiology 3:295, May; 398, July 1942.

*See p. 1042 of this issue for first installment of testimony given at the hearings.

tional Congress of Parents and Teachers, the American Association of Public Health Dentists, the dental subsection of the American Association for the Advancement of Science, the Dental Health Section of the American Public Health Association, the National Dental Association, organized labor, the American Council on Education and various individual dentists and research workers.

The unanimity of opinion in favor of the bills indicates that they are a constructive beginning on the great and complex problem of improving national dental health. Such unanimity should commend itself to the members of the Senate Committee on Education and Labor, before which the bill now rests for decision and report to the Senate.

ANNIVERSARY OF THE ARMY MEDICAL DEPARTMENT

The Army Medical Department celebrated the 170th anniversary of its founding July 27. The department was established in 1775 shortly after General George Washington became commander-in-chief of the Continental Army. In the intervening years, the department has borne the burdens of four major conflicts, and it now finds itself engaged in the tasks of the fifth and greatest. Its achievements in this war, to which the Medical, Dental, Veterinary, Nursing and Medical Administrative Corps have all contributed, is unparalleled in military annals. No other army in history, as the Surgeon General proudly stated recently, has achieved a record of recovery from wounds and freedom from disease comparable with that of the American Army in World War II.

Seventeen thousand members of the dental profession have had a direct part in compiling that outstanding record of service and accomplishment. To them and to the other officers and personnel of the Medical Department, the country owes not only a complimentary salute on the anniversary, but also permanent and unwavering gratitude for the years to come.

REPORTS OF COUNCILS AND COMMITTEES

COUNCIL ON DENTAL HEALTH

RECOMMENDATIONS OF THE NEW YORK STATE COUNCIL ON DENTAL HEALTH

The work of the New York State Council on Dental Health has resulted in a number of recommendations for the development of an experimental dental care program for children. The plan was approved by the executive council of the state society in May 1945. The recommendations are as follows:

1. A dental health education and dental care program starting with initial care for 6-year-old children and incremental care up to age 12 is desirable and endorsed by the Council.

2. Based on the prepared plan, it is recommended that dental care should be provided through tax moneys for children from families which cannot afford to pay for it. It is conceded that an appreciable number of children may be from families not on relief rolls or entitled to home relief (families earning less than $100 per month) who should be entitled to the above service when so designated following adequate investigation. Families able to afford private care should be directed to their family dentists.

3. From the economic, supervisory and transportation aspects, it is agreed that the corrective service could be rendered to better advantage in a school or centralized office.

4. It is recommended that the dental care program be initiated in approximately three counties on a demonstration basis as soon as possible. The counties selected should have reasonably stable populations.

5. Essential services would be rendered and standards of services should be as outlined by the American Dental Association in its pamphlet "A Dental Care Plan for Low Income Groups."

6. Salary. We are advised that full-time dentists' salaries are established by the Civil Service Commission. The present salary for senior dentists is from $3,600 to $4,350. There is no title "Supervising Dentist" at the present time, but in all probability it would be one grade higher than the senior dentist and the salary will be $4,000 to $5,000. Dental hygiene teachers are paid by school boards on a similar basis as elementary school teachers. The salaries vary in different communities, the minimum being $1,400. Where part-time dentists are employed on a fee per clinic basis, the fee should be $15 per 3-hour clinic session.

7. It is recommended that a subcommittee of the Council on Dental Health be appointed to serve in an advisory capacity to the state board of health and the state department of education to further this plan.

Steps are now being taken to carry out the recommendations. The expanded dental care program will be established on a demonstration basis in two or three counties provided sufficient funds are secured through the state department of health.

The report of the New York State Council on Dental Health also contained recommendations for dealing with other problems, as follows:

While it would seem that the necessity for the New York state prehabilitation program, as originally outlined, does not at the present time require the emphasis on preparing high school students for military service, it was the consensus of the committee that the primary objectives of the prehabilitation program were to encourage and further extend dentistry's long range educational program for the control of dental disease,

and to maintain interest in the population during the years immediately following the war. The committee therefore made the following recommendations, which were approved by the state council on dental health:

1. That the New York state prehabilitation program should be continued during the present emergency awaiting more definite information regarding postwar compulsory military training.

2. That the Dental Society of the State of New York should continue to expand its efforts for an educational program for the members of the dental profession, to fully acquaint dentists with all of the objectives of the plan, and to secure a higher percentage of the members of the profession to cooperate.

3. It is also recommended that the program as outlined should not be extended to include other groups excepting in such districts as have already extended the plan, until satisfactory results have been obtained from the presently limited program. The exception was inserted in this recommendation because, in some districts, for example the second district, plans have already been initiated to include other than high school seniors in their program.

4. It is further recommended that the Secretary of the Council on Dental Health advise each district society to emphasize children's dentistry in its program and that this activity should be publicized in the state and district journals.

The question of excuses for school children to keep dental appointments during school hours when necessary was discussed. In this connection it was pointed out that at some schools children have used this excuse to leave school when no dental appointment was involved. In order to establish a uniform procedure so that school officials may be certain that the appointments are legitimate, the Council approved an official appointment blank as illustrated, which should be prepared and printed by the Dental Society of the State of New York and distributed to all members of the Society.

THE DENTAL SOCIETY OF THE STATE OF NEW YORK
Dental Health Education Program
(SEAL)

This is to certify that.....
has an appointment in my office for dental treatment on.....at.....o'clock.
.....DDS
Treatment administered
.....DDS

Recommendations were also adopted to suggest that members of the dental profession, in their individual practices, encourage high school girls to become dental hygienists and to request local guidance directors to acquaint senior high school students with the possibilities and desirability of following careers as dentists, dental hygienists and dental hygiene teachers.

All of the recommendations of the New York State Council on Dental Health were referred to and approved by the Executive Council of the New York State Dental Society.—*Allen O. Gruebbel, Executive Secretary.*

COUNCIL ON DENTAL THERAPEUTICS

EXAMINATION OF PRODUCTS BY THE COUNCIL ON DENTAL THERAPEUTICS AND THE A.D.A. BUREAU OF CHEMISTRY

The Council has authorized publication of the following report.—*Donald A. Wallace, Secretary.*

The A.D.A. Bureau of Chemistry was founded in 1927. Its first chemist was trained in the chemical laboratory of the American Medical Association. The Council on Dental Therapeutics was

founded in 1930. It is specified in the By-Laws of the American Dental Association that the secretary of the Council shall be director of the Bureau. The two agencies work together.

The Council and the Bureau are sponsored entirely by the American Dental Association. No compensation of any sort is accepted from outside sources. This means that the Council and the Bureau are under obligation only to the members of the American Dental Association.

The Bureau of Chemistry occupies a well-equipped chemical laboratory, which is operated in conjunction with the office of the Council. Every product that is on the list of Accepted Dental Remedies is examined at least once every three years. Dentifrices are examined at least once every year. Many unaccepted products, as well as those on the accepted list, are also examined.

Drugs and cosmetics may be divided into two classes: (1) those that are listed in the United States Pharmacopoeia or the National Formulary and (2) those that are not listed in any official publication. Such well-known drugs as phenol, ammoniacal silver nitrate, zinc oxide and ether are in the first class. The quality of such products is known to be sufficiently uniform, especially if they are supplied by well-established firms, to make it unnecessary that a complete chemical examination of them be made routinely. They are subject to routine checking by the extensive laboratories of the Food and Drug Administration, as are all foods, drugs and cosmetics. The second class of products, which includes such preparations as procaine HCl cartridges, dentifrices, unofficial dental ointments and zinc oxide-eugenol cements receive special attention in the Bureau of Chemistry. Every accepted brand of these materials is checked thoroughly with regard to chemical composition.

As a concrete example, the procedure followed in the laboratory examination of injectable procaine solutions is described here.

Samples of solutions of procaine HCl supplied by the distributor are analyzed quantitatively for procaine, epinephrine or cobefrin, titratable acidity, total solids and ash. The pH value is determined and the product is examined for undissolved sediment. As with all products tested in the Bureau of Chemistry, if there is any reason to suspect the reliability of the manufacturer's samples, trade packages are purchased on the open market and analyzed without the prior knowledge of the manufacturer or distributor. The manufacturers of all accepted local anesthetic solutions for injection are required to sign statements to the effect that they will check every batch of every dosage form of their accepted products for sterility. From time to time, representatives of the Council inspect the plants where accepted local anesthetic solutions are manufactured. The laboratory facilities, the plant and laboratory records and the qualifications of the personnel are checked. Samples of the products are examined occasionally by Council consultants to determine whether they are actually sterile. When a product is found not to meet the requirements of the Bureau of Chemistry, the manufacturer is warned and samples of his product purchased on the open market at intervals after the warning has been issued are examined. If the product is not brought up to standard within a reasonable time, it is deleted from A.D.R. If the shortcoming of the product is sufficiently serious to warrant publicity, a report setting forth the reasons for its deletion is published in THE JOURNAL.

Samples of all accepted dentifrices, as well as all of the more widely sold unaccepted brands, are checked routinely for pH (acidity or alkalinity), abrasiveness and lead content. The latter test, which is applied only to the tooth pastes,

is necessary because almost all tooth pastes made in this country are now packaged in lead tubes. Council-accepted dentifrices are limited to 20 parts of lead per million parts of dentifrice. When unaccepted products with higher lead content are discovered, the facts are reported to the Food and Drug Administration. The abrasive ingredients of accepted dentifrices must meet the specifications of the Bureau of Chemistry before the dentifrice can be accepted. The abrasive ingredients are tested separately for abrasiveness by two methods and also for pH.

In addition to routine checking of accepted products, the Council requires that it be informed of the composition of all accepted products and that it be notified of all changes which may be made in the composition of such products. There are many classes of products, including dentifrices and mouth washes, in which changes of composition are often made by the manufacturers without notice to anybody responsible to the public or to the profession. Constancy of composition is an important feature of Council-accepted products.

Every effort is made by the Council and the Bureau, through their own facilities and through cooperation with government agencies and other groups that are interested in the protection of the public and the profession, to merit the confidence of the members of the Association. There is no question that, as a class, Council-accepted products are more dependable than those that are not accepted. In your patients' interest, use and prescribe only Council-accepted products.

WAR SERVICE COMMITTEE

PROCEDURE TO PRODUCE SURPLUS SUPPLIES AND EQUIPMENT

The following statement by Maj. Richard J. White, Jr., M.A.C., on procedures necessary to procure surplus medical and dental supplies and equipment was made available through the War Service and Postwar Planning Committee:

The long awaited regulations giving veterans priority on sale of surplus property was recently made public. The new veterans' priority ruling gives veterans who operate a small business or enterprise the right to purchase surplus property direct from the government through the Smaller War Plants Corporation, rather than buying through regular dealers.

The procedures for procuring surplus by veterans was established in Surplus Property Board Regulation 7, dated May 26, 1945. This regulation provides for the purchase by veterans of surplus medical and dental supplies and equipment by defining medical and dental enterprises as "small business or professional enterprises."

Section 16 of the Surplus Property Act of 1944 states:

"The Board shall prescribe regulations to effectuate the objectives of this Act to aid veterans to establish and maintain their own small business, professional, or agricultural enterprises, by affording veterans suitable preferences to the extent feasible and consistent with the policies of this Act in the acquisition of the types of surplus property useful in such enterprises."

Surplus Property Board Regulation 7, paragraph 8307.1, sets forth the following definitions:

a. " 'His own small business or professional enterprise' shall include any commercial, industrial, manufacturing, financial, service, legal, medical, dental, or other lawful enterprise (other than agricultural) having an invested capital not in excess of $50,000, which a veteran maintains or desires to establish: *Provided*, that he is or will be, directly or indirectly, the sole proprietor thereof or that no

person or persons, other than other veterans, have or will have any proprietary interest in the enterprise, singly or together, directly or indirectly, in excess of 50 per cent of either the capital invested in such enterprise or of the gross profits or income thereof.

b. " 'Surplus property' means any property which has been determined to be surplus to the needs and responsibilities of the owning agency in accordance with the Surplus Property Act of 1944.

c. " 'Veteran' means any person who served in the active military or naval service of the United States during the present war, or any person who served in the active military or naval service of the United States on or after September 16, 1940, and prior to the termination of the present war, and who has been discharged or released therefrom under honorable conditions."

The following listed paragraphs, quoted from Regulation 7, are those especially applicable to doctors and dentists in the Armed Forces who will want to have the opportunity to purchase surplus medical and dental supplies and equipment to establish them in their profession:

a. 8307.3—*"Veteran's application for property useful in business or professional enterprises.* Any veteran desiring to exercise the preference hereby granted in the purchase of surplus property useful to establish or maintain his own small business or professional enterprise shall file an application for such property with the district office of the Smaller War Plants Corporation for the locality within which he maintains or intends to establish such enterprise.

b. 8307.4—*"Purchase by Smaller War Plants Corporation of property useful in business or professional enterprises.* The Smaller War Plants Corporation will exercise its priority right in the manner and to the extent provided in Part 8302[1] and any amendments thereof, to purchase from the appropriate disposal agency for resale to the veteran such property as he may apply for which in its judgment is required for preserving or for strengthening the competitive position of small enterprise.

In forming such judgment the Smaller War Plants Corporation will take into account whether the property will be useful in and will aid the veteran to establish or maintain his own small enterprise and whether business conditions and other economic factors affecting the locality within which the veteran maintains or desires to establish such enterprise render the success thereof reasonably probable. Smaller War Plants Corporation will report to the Surplus Property Board all instances in which the veteran's application is rejected in whole or in part and the reasons for such rejection.

c. 8307.8—*"Pricing.* In selling surplus property to the Smaller War Plants Corporation for resale to a veteran hereunder, disposal agencies shall comply with applicable regulations of the Office of Price Administration, but in no case shall charge a price which is greater than the cost of acquisition thereof to the Government, less appropriate allowances for depreciation, obsolescence, wear and tear, and such other factors as may relate to the condition or utility of the property. The Smaller War Plants Corporation will charge the veteran no greater price than the price charged by the disposal agency: *Provided, however,* that the Smaller War Plants Corporation may increase such price by the actual cost of delivering the property to the veteran if such cost is not included in the disposal agency's price.

d. 8307.9—*"Consignments directly to veterans by disposal agencies.* Upon the request of the Smaller War Plants Corporation, disposal agencies shall forward directly to the veteran property purchased hereunder for resale to him."

The present offices of the Smaller War Plants Corporation referred to in paragraph 8307.3, above, are as follows:

Region I

Bridgeport 3, Conn., 144 Golden Hill St.; *Hartford 4, Conn.*, 119 Ann St.; *New Haven 10, Conn.*, 152 Temple St.; *Portland 3, Maine*, 142 High St.; *Boston 8, Mass.*, 17 Court St.; *Lowell, Mass.*, 8 Merrimac St.; *Springfield 3, Mass.*, 1200 Main St.; *Worcester 8, Mass.*, 340 Main St.; *Manchester, N. H.*, Amoskeag Industries Bldg.; *Providence 3, R. I.*, 631 Industrial Bldg.; *Montpelier, Vt.*, 84 State St.

Region II

Newark, N. J., 20 Washington Pl.; *Albany, N. Y.*, 112 State St.; *Brooklyn, N. Y.*, 16 Court St.; *Buffalo, N. Y.*, 808 Rand Bldg.; *New York 1, N. Y.*, 350 Fifth Ave.; *Rochester,*

1. SPB Reg. 2(10 F.R. 5104).

N. Y., 723 Commerce Bldg.; *Syracuse, N. Y.*, 224 Harrison St.; *Utica, N. Y.*, First National Bank Bldg.

Region III

Wilmington 50, Del., 406 Pennsylvania Bldg.; *Baltimore 2, Md.*, 1114 O'Sullivan Bldg.; *Trenton 8, N. J.*, 622-623 Broad Street Bank Bldg.; *Allentown, Pa.*, 512-514 Hamilton St.; *Reading, Pa.* (Suboffice of Allentown), 901 Colonial Trust Bldg.; *Harrisburg, Pa.*, 713 Blackstone Bldg.; *York, Pa.* (Suboffice of Harrisburg), Yorktowne Hotel; *Philadelphia 3, Pa.*, 1612 Market St.; *Scranton 3, Pa.*, 418 First National Bank Bldg.; *Richmond 19, Va.*, 101 Richmond Trust Bldg.; *Norfolk 10, Va.* (Suboffice of Richmond), 319 Wainwright Bldg.; *Roanoke, Va.* (Suboffice of Richmond), 416 Morris Plan Bank Bldg.

Region IV

Birmingham 1, Ala., Phoenix Bldg.; *Jacksonville 1, Fla.*, 314 W. Monroe St.; *Tallahassee, Fla.* (Suboffice of Jacksonville), 312 East Gaines St.; *Tampa 2, Fla.* (Suboffice of Jacksonville), 801 Stovall Professional Bldg.; *Miami 32, Fla.*, Congress Bldg.; *Atlanta 3, Ga.*, 1404 Candler Bldg.; *Jackson 1, Miss.*, Tower Bldg.; *Charlotte 2, N. C.*, Charlotte Law Bldg.; *Columbia 56, S. C.*, Waters Bldg.; *Chattanooga, Tenn.*, James Bldg.; *Knoxville, Tenn.*, Fidelity Bankers Trust Bldg.; *Memphis 1, Tenn.*, Sterick Bldg.; *Nashville 3, Tenn.*, Stahlman Bldg.

Region V

Louisville 2, Ky., 200 Hoffman Bldg.; *Canton 2, Ohio*, 717 First National Bank Bldg.; *Cincinnati 2, Ohio*, 38-40 East Fourth St.; *Cleveland 14, Ohio*, East Wing Lobby, Union Commerce Bldg.; *Columbus 15, Ohio*, 145 North High St.; *Dayton 2, Ohio*, 129 South Ludlow St.; *Lima, Ohio*, Colonial Finance Bldg.; *Erie, Pa.*, 418 Commerce Bldg.; *Pittsburgh 22, Pa.*, 801 First National Bank Bldg.; *Charleston 1, W. Va.*, 612 Atlas Bldg.

Region VI

Chicago 6, Ill., 226 W. Jackson Blvd.; *Decatur, Ill.*, 339 Standard Office Bldg.; *Peoria, Ill.*, 1103 Alliance Life Bldg.; *Rockford, Ill.*, 722 Gas and Electric Bldg.; *Evansville 9, Ind.*, 8 Koenig Bldg.; *Fort Wayne 2, Ind.*, 216 Utility Bldg.; *Indianapolis 4, Ind.*, 1027 Circle Tower Bldg.; *South Bend 9, Ind.*, 510 Sherland Bldg.; *Davenport, Iowa*, 712 Kahl Bldg.; *Des Moines 9, Iowa*, 524 Liberty Bldg.; *Eau Claire, Wis.*, 128½ Graham Ave.; *Green Bay, Wis.*, 206 Main St.; *Madison 3, Wis.*, 403 Washington Bldg.; *Milwaukee 1, Wis.*, 161 W. Wisconsin Ave.; *Wausau, Wis.*, First American State Bank Bldg.

Region VII

Kansas City, Mo., 500 Mutual Bldg.; *St. Louis, Mo.*, 915 Paul Brown Bldg.; *Wichita, Kan.*, 1415 Union National Bank Bldg.; *Little Rock, Ark.*, 312 Pyramid Bldg.; *Omaha, Nebr.*, 917 City National Bank Bldg.

Region VIII

New Orleans 12, La., 407 Canal Bldg.; *Oklahoma City, Okla.*, 324 Key Bldg.; *Tulsa 3, Okla.*, 512 Petroleum Bldg.; *Dallas 1, Texas*, 510 Mercantile Bank Bldg.; *Houston 2, Texas*, 1006 Electric Bldg.; *San Antonio 5, Texas*, 1904 Transit Tower Bldg.

Region IX

Denver 2, Colo., Continental Oil Bldg.; *Albuquerque, N. M.*, Metropolitan Bldg.; *Salt Lake City 1, Utah*, 319 Atlas Bldg.

Region X

San Francisco 3, Calif., 1355 Market St.; *Boise, Idaho*, Capitol Securities Bldg.

Region XI

Detroit 2, Mich., 424 Boulevard Bldg.; *Grand Rapids, Mich.*, 310 Keeler Bldg.; *Toledo 4, Ohio*, 815 Security Bldg.

Region XII

Duluth, Minn., 310 Christie Bldg.; *Minneapolis, Minn.*, 720 Hodgson Bldg.; *Fargo, N. D.*, 207 Walker Bldg.; *Sioux Falls, S. D.*, 310 Policyholders Bldg.

Region XIII

Helena, Mont., 224 Power Block; *Portland, Ore.*, 608 Bedell Bldg.; *Spokane, Wash.*, 1023 West Riverside; *Seattle, Wash.*, 4452 Stuart Bldg.

Region XIV

Phoenix, Ariz., 426 Security Bldg.

There is at present no indication as to the

extent to which medical and dental supplies and equipment will be in surplus and available to doctors and dentists upon their release from active duty.

Surplus lists will be screened for the needs of the Federal Agencies before they shall become available to released doctors and dentists.

COMMITTEE ON LEGISLATION

AMENDMENTS TO THE ILLINOIS DENTAL PRACTICE ACT

As a result of a recent Supreme Court decision* and the enactment of amendments to the state dental practice act, the advertising dental laboratories in Illinois are conforming strictly to the new provisions or going out of business. At the present time, no Chicago newspaper is carrying any dental laboratory advertising.

For a number of years, the state of Illinois, and especially the city of Chicago, has been known as the center of the activities of the large dental laboratories which deal with the public directly. During that time, the Chicago Dental Society, the Illinois State Dental Society and the American Dental Association have attempted to correct this situation. As a result of these efforts, it was established that certain improvements in the state dental practice act were badly needed.

The Illinois State Dental Society, as the parent organization, and the Chicago Dental Society, as the largest component, then prepared revisions to the dental practice act and sponsored their introduction in the state legislature. The bill passed both houses of the legislature without a dissenting vote and was signed by the governor.

Commenting on the amendments to the act, a representative of the state and local dental societies said:

> We feel that new provisions in the dental practice act will eliminate laboratories which make dentures directly for the public. Two of these provisions are Section 5a and Section 17a.
>
> Section 5a provides that dental laboratories may construct dentures, "exclusively, directly and solely for licensed members of the dental profession and not for the public." This section also makes it illegal for dental laboratories to advertise except in trade journals and professional publications. It is our belief that if dental laboratories cannot advertise to the public, the unethical laboratories will not be able to stay in business.
>
> Section 17a provides for the enforcement of the dental practice act through injunction proceedings. This means that courts may enjoin violators of dental laws and may incarcerate persons who disobey the injunction provisions. In the past, there have been instances in which violators, on arrest and conviction, paid their fines and continued to violate the law. We feel this new injunction provision will prove an effective means for permanently restraining such violators. The use of injunction in preventing violations of the criminal law is a new and modern development that has proved successful in preventing violations of other criminal laws.

At the same time that the changes in the Illinois Dental Practice Act were being proposed, the Illinois State Department of Registration and Education was also seeking to enforce the existing law as far as possible. As a result of its activity, an important decision dealing with dentists was handed down by the Supreme Court of Illinois, May 23, 1945. The principal point made in that decision is that dentists are guilty of unprofessional conduct whenever they take an impression at the request of a dental laboratory in order to enable the labora-

*J.A.D.A. 32:904, July 1, 1945.

tory to evade the law. The court held that the license of a dentist may be revoked for such action. This decision is a culmination of two years' effort on the part of the Department of Registration and Education to enforce the provisions of the state dental practice act regulating dental laboratories. While the case was pending before the Supreme Court, the Department of Registration and Education continued its campaign against these violators, and dentists associated with every large unethical dental laboratory in Chicago were cited for revocation of their licenses. Several licenses have been revoked and many cases are still pending. Several dentists have voluntarily severed their connection with laboratories and some have moved to other states.—*George H. Fox, Secretary.*

SENATE HEARINGS ON DENTAL RESEARCH AND GRANTS-IN-AID BILLS

Hearings on two bills, sponsored by the American Dental Association, which would provide federal funds for intensified dental research and for grants-in-aid to the states for dental purposes, were held before a subcommittee of the Senate Committee on Education and Labor, Washington, June 26-28.

Appearing for the bill on behalf of the American Dental Association were: Carl O. Flagstad, chairman, Committee on Legislation; Sterling V. Mead, President Elect; Lon W. Morrey, Director, Bureau of Public Relations; Allen O. Gruebbel, executive secretary, Council on Dental Health; Philip Jay, director, Dental Caries Research, University of Michigan; Kenneth A. Easlick, Director, Department of Children's Dentistry, University of Michigan; Leslie M. FitzGerald, chairman, Committee on Economics; C. Willard Camalier, chairman, War Service Committee; Fred O. Conrad, president, Florida State Dental Society; Harold Hillenbrand, Editor of THE JOURNAL; George H. Fox, secretary, Committee on Legislation, and Joseph E. Bagdonas, secretary, Committee on Economics.

Others supporting the bill were: Thomas Parran, Surgeon General, United States Public Health Service; Russell A. Dixon, dean, College of Dentistry, Howard University and representative of the National Dental Association; Melvin L. Dollar, School of Public Health, University of Michigan; Sumter S. Arnim, chairman, Committee on Research and Graduate Study, School of Dentistry, Medical College of Virginia; Vern D. Irwin, director, Dental Division, Minnesota State Department of Health, representing the American Association of Public Health dentists; Alfred J. Asgis, chairman, Health Council, American Labor Party; Francis J. Brown, consultant, American Council on Education; Charles L. Hyser, chairman, executive committee, American Association for Dental Health; Paul C. Kitchin, secretary, Dental Subsection, American Association for the Advancement of Science; Sal Pischedda, American Communications Association, C.I.O., and Mrs. Glenn L. Swiggett, National Congress of Parents and Teachers.

Excerpts from the testimony given at the hearings are published below and will be concluded in later issues of THE JOURNAL.

The hearing was called to order at 10:10 a.m., June 26, 1945, in Room 424, Senate Office Building, Sen. Claude Pepper, Florida (chairman), presiding.

Present: Senators Claude Pepper, Florida; James M. Tunnell, Delaware; George D. Aiken, Vermont; H. Alexander Smith, New Jersey.

Also present: Mr. Carl Malmberg, Chief Investigator, Subcommittee on Wartime Health and Education; Mr. Charles Kramer, Staff Director.

THE CHAIRMAN: The committee will come to order, please.

We are opening public hearings today on two dental bills, S. 190* and S. 1099,* copies of which I submit for inclusion in the record. . . .

THE CHAIRMAN: Both of these bills have been referred to the health subcomittee for consideration. The subcommittee will report its findings to the full Committee on Education and Labor.

We are holding simultaneous hearings on the two bills because they quite clearly supplement one another. S. 190, introduced by Senator James Murray, the distinguished chairman of the Committee on Education and Labor, would further the development of dental research by establishing a National Institute of Dental Research. S. 1099, introduced jointly by Senator George Aiken, the able Senator from Vermont, and myself, is a dental care bill which would provide funds to the states and localities to assist them in putting into practice existing dental knowledge, as well as the new knowledge that will be acquired if Senator Murray's bill becomes law. Senator Aiken and I believe that our bill will bring badly needed dental care to many more people than are now getting it, that it will help train sorely needed dental personnel, that it will help to improve both the quality of dental care and the methods of payment for dental services, and especially that it will enable more children to receive the dental care they deserve but do not now get. The purpose of S. 1099 is to get teeth filled; the purpose of S. 190 is to discover means of preventing teeth from having to be filled.

A little less than a year ago today, the Subcommittee on Wartime Health and Education held hearings here in Washington at which the results of the Selective Service and Army physical examinations were presented in some detail. We were shocked to find the appalling extent of dental disease and dental neglect among our young men of military age. We found, for example, that from November 1940 to January 1942 dental defects were the leading cause of rejection for military service. Nine out of every 100 men who came up for examination during this period were rejected because of dental defects. We asked if perhaps the dental standards were not unduly high, if the Armed Forces were not being perfectionist, and if the Nation's status was really as bad as these figures made it seem. Unfortunately the standards were anything but high, we were told. All a man needed to have at that time was "six serviceable opposing posterior teeth as compared with twenty usually provided by nature, and six opposing anterior teeth as contrasted with the natural complement of twelve." In other words, only twelve teeth out of the usual thirty-two were necessary, provided they were in the right place.

Captain C. Raymond Wells, Chief Dental Officer of the Selective Service System, who was also president of the American Dental Association at that time, told us ". . . it will be realized that the mouths of those rejected must have suffered severe damage from dental disease and that there is a probability of an alarming amount of damage in the mouths of many who passed the examination." Selective Service records in a sample period (April-July 1942) showed the average Selective Service registrant to have six teeth missing and two teeth decayed.

The result was a great loss of manpower for the Armed Forces at a time when military manpower was needed critically. But the Army tackled the problem in a vigorous and forthright manner. A third of the Nation's dentists were commissioned into the Army Dental Corps. The dental standards for induction into the Armed Forces were lowered so that men were inducted despite severe dental defects. Working in three shifts, the Dental Corps then succeeded in dental rehabilitation of more than a million men who would have been rejected under the previous standards. During 1942 and 1943 alone, the Army Dental Corps supplied 50,000,000 fillings and more than 1,400,000 bridges and dentures to our soldiers. To do all this they used three and one-half times the amount of dental supplies and equipment normally produced in the United States in any one year.

All this set our subcommittee to exploring the subject further. Was the extent of dental disease and dental neglect as widespread throughout the whole civilian population as among the Selective Service registrants? Studies conducted by the U. S. Public Health

*For texts of these bills, see J.A.D.A. 32:231, February 1, and 790, June 15, 1945.

Service and the American Dental Association showed us that this was undoubtedly the case, and that the neglect of children's dental defects is an especially serious problem. Despite the prevalence of dental defects, the best estimates indicate that only 20 or 30 per cent of the population is getting the dental care it needs. Some action obviously is required. The purpose of these hearings is to determine what that action shall be.

American dentistry has gained a well-deserved reputation of excellence throughout the world. American dentists have justifiably won world-wide recognition and acclaim. Fortunately, American dentistry does not propose to remain satisfied with what it has achieved. It is not satisfied with the *status quo*. Instead, it has decided to go forward toward better and higher levels of dentistry and not to be satisfied until it succeeds in bringing good dental care to every single person in the country. Accordingly, the American Dental Association, and other groups and individuals in dentistry, have given us their fullest cooperation in the drafting of the legislation that is now before us for consideration. We are deeply grateful to them for their cooperation and assistance, not least because of their generosity in taking time from overloaded office schedules to work on this matter of public interest.

Dr. Parran, the distinguished Surgeon General of the Public Health Service, is here. Dr. Parran, we are glad, as always, to have you here, and we welcome your statement. Will you come forward?

STATEMENT OF SURGEON GENERAL THOMAS PARRAN, UNITED STATES PUBLIC HEALTH SERVICE

DR. PARRAN: Thank you, Mr. Chairman, it is a pleasure to appear before this committee at your request. I am not informed as to the relation of S. 190 and S. 1099 to the program of the President. Therefore, I shall speak only from a professional point of view concerning the problems with which these bills are concerned.

Since you, Mr. Chairman, have already given an analysis of the major provisions of these two measures, I think with your permission I should like to emphasize that the two bills are interrelated. One deals primarily with research and the other with dental care and service and the development of improved methods for giving that service. Together, these bills provide a broad approach to a serious national health problem.

I should like to outline the incidence and extent of dental disease, to give the committee some indication of the amount of dental care being received, the costs of such care, the number and distribution of the members of the dental profession, and the results of experimental and research technics which have thus far been undertaken, even though on a small scale; and finally I should like to suggest some methods of attacking the several aspects of the problem.

As you have stated, Mr. Chairman, dental diseases are among the most common of human ailments. Almost all the population is afflicted with them, and they often induce a train of related maladies. Dental diseases are not peculiar to any one group of people, whether defined by age, race, sex, geographic location, or economic status. The common pattern is dental decay, toothache, tooth loss, malocclusion, pyorrhea and eventual loss of teeth.

The two major causes of dental ill health are caries and pyorrhea. Dental caries, or tooth decay, is the destroyer of most teeth that are lost by persons in the younger years of life. Later, beginning in the middle thirties, pyorrhea takes over as the major enemy of dental health. In fact, dental caries starts to work almost as soon as the child's teeth erupt. More than nine of every ten children, by the time they reach the age of 6, have one or more decayed teeth. That is just the beginning. At about this time, caries begins in the permanent teeth, so that by the time a boy or girl reaches 18, nine teeth, on the average, have become decayed and several extractions have been made. This continuing loss of teeth upsets the proper arrangement of the others, and predisposes to pyorrhea, a tissue disease which takes a heavy toll of the teeth remaining in adult life. In addition, neglected, untreated, diseased teeth and gums may be the direct or indirect cause of many other maladies, including toothache, acute dental abscesses and focal infections with resulting arthritis, neuritis, neuralgia, valvular heart disease and diseases of the kidneys and the gastrointestinal tract.

The opportunities for carrying out dental studies in the past, and the funds expended thereon, have been distinctly limited. In com-

parison to the importance of this great national health problem, relatively little has been done by way of research. That fact, it seems to me, makes it important that the provisions of S. 190 should be put into effect in order to develop a comprehensive and nationwide, coordinated attack on the scientific aspects of this problem. We do not have now the specific knowledge which would enable us with certainty to prevent dental caries.

You referred briefly to studies made by the Public Health Service. In the City of Hagerstown, in 1937, we examined more than 4,400 children, which was 94 per cent of the school enrollment, and found approximately 12,000 permanent teeth which had been attacked by caries, and of primary teeth, another 10,000. This represented an accumulation which was the result of neglect. We found that caries develops in children at a very constant rate from year to year. One additional tooth every sixteen months becomes carious, that is, decayed, making an accumulation, as I have indicated, of nine carious teeth by the age of 18. This rate which we found in Hagerstown is approximately the national rate.

In 1933 and 1934, the Public Health Service, with the fine cooperation of some 8,000 practicing dentists, surveyed the dental needs of nearly a million and a half school children in twenty-six states. They included both white and colored, and there was equal representation of both sexes. The findings of this survey were similar to those of the Hagerstown study. Other investigations carried out by the dental profession show essentially the same thing.

You have referred here, Mr. Chairman, to the seriousness of the developing dental defects in children, as shown in the Selective Service examinations. I shall not repeat these facts which you have stated so clearly.

The Army Dental Division has done a tremendous amount of rehabilitation, amounting to some 67,000,000 fillings, 15,600,000 extractions, replacement of more than 17,000,000 teeth, the provision of 2,500,000 dentures, repair of another 685,000 dentures; and fixed bridges provided, some 231,000. Treatments for pyorrhea, prophylactic treatments, amounted to nearly 9,000,000. In short, for every hundred men inducted into the Army, they have provided seventy extractions and 240 fillings.

It is apparent that the dental health of the young men of this country, men who should be at the peak of their efficiency, is not good.

THE CHAIRMAN: How many extractions?

DR. PARRAN: Fifteen million six hundred thousand.

THE CHAIRMAN: I mean for every hundred?

DR. PARRAN: Seventy extractions per hundred.

Our dental officers have made some estimates as to the accumulated dental needs of the whole population. Without giving you the totals in terms of extractions and fillings needed, let me summarize by saying that of every hundred persons on the average in the general population, there are needed 190 extractions, 300 fillings, 100 dental examinations, thirty crowns and bridges and twenty full dentures.

Not only does neglect of dental defects add to the volume, but it also adds to the severity of the defects.

The unfilled needs as compared with service reveals that only a small fraction of the amount of dental service is being given in comparison with the need. In fact, we have estimated that it will require 800,000,000 hours of dental work, service on the part of the dentist, to catch up with this vast accumulation of dental neglect. As I figure that out in terms of man years, it amounts to the services of about 400,000 dentists for one year, and, thinking in those terms, recall, if you will, that the total number of dentists in the country is about 70,000 to 75,000.

SENATOR AIKEN: How long would it take to catch up on that work, Dr. Parran?

DR. PARRAN: It would be a never-ending job, Senator, with our present resources.

SENATOR AIKEN: It would be impossible to catch up on that work with our present resources and the present number of dentists?

DR. PARRAN: That is correct. As a result, as I expected to testify here this morning, we would propose that emphasis be given to the care of children as provided under S. 1099, so if one starts with the beginning grade in school or takes just the younger grades in school successively year by year, pretty soon we will have caught up with at least dental neglect in childhood.

SENATOR AIKEN: Has there been improvement in recent years in dental inspection and dental work in schools?

DR. PARRAN: There has been some extension of dental work in schools, but the total number of dentists in the country now, in relation to the population, is less than it was ten years ago, even when one includes all of the men who are in the military forces.

Additional steps which would spread our present dental manpower more widely would be to use, under the supervision of a dentist, less well-trained subsidiary assistants who could do the simpler tasks under the direction of the dentist and thereby spread the work of one skilled dentist more widely.

A third approach to the problem obviously is to train more dentists and to increase the total amount of dental manpower.

SENATOR AIKEN: I happen to have been on the school board in a rural area of Vermont where we started this work with the help of some kind friends nineteen years ago, and have had an opportunity to observe the change in the pupils after we began to get the effects of this dental correction, and also in the case of eyes and tonsils, of course. It seemed to me that the investment has returned dividends which probably can't be counted in terms of dollars, but, if they could be, would make it one of the best paying investments that we ever made.

DR. PARRAN: I am sure of it, Senator, and in many places we have seen gratifying results from such programs as school dental service.

However, in a large proportion of schools, the dental inspections are made and the number of teeth which need care are listed, and a note is written home to the parent, and frequently nothing is done about it.

SENATOR AIKEN: We usually found a way to get it done, but I know from experience that school children howl all night with a toothache and study next day.

DR. PARRAN: It would be difficult to measure the loss in educational efficiency as the result of dental ill health.

I have indicated that it would be difficult, in fact quite impossible, for us in any measurable period with available professional resources to catch up on the accumulated neglect of the past, and I have indicated some directions in which it seems to me the problem might be approached. I have said that the number of dentists is less than in previous years. Between 1930 and 1940, the ratio of dentists to population was, in 1930, one dentist to over 1,720 people; in 1940, one dentist to over 1,865 people, and more than that, since the Army and Navy training programs are being discontinued, or have been discontinued, we can look forward postwar to a great deficit in the number of dentists in the country.

All studies show, in reference to dental needs, that the amount of dental neglect, of dental ill health, varies inversely with family income. The same is true of other phases of public health and other health and disease problems, but lack of income is by no means the sole cause of dental ill health.

We find, Mr. Chairman, as we make studies of the geographic distribution of dentists in the country, the same pattern that your committee has found in reference to the distribution of doctors and nurses and hospitals. In areas of lowest income, there is the lowest ratio of dentists.

We find also a great variation in the amount of dental service received by people in the successive income groups. In the low income groups, naturally there is less money to be spent for dental care, and the amount of dental care given is much less than in the higher income groups.

During the past decade or more, the Public Health Service has been carrying out some studies in reference to various aspects of this problem. We have done this with a very small staff and a limited budget, which work has had to be curtailed from time to time as the demands of the war and other demands for dental care have become more acute. . . .

(To be continued in the next issue of THE JOURNAL.)

NEWS OF DENTISTRY

Defer Annual A.D.A. Meeting at Government Request

In accordance with the request of the War Committee on Conventions, the annual meeting of the House of Delegates of the American Dental Association, which was to have been held in Chicago September 17-19, has been deferred. A meeting of the Ad Interim Committee of the Board of Trustees will be held in Chicago July 21-22 in order to discuss the problems brought about by the deferment, according to Harry B. Pinney, General Secretary.

Therapeutics Council Increases Price of Accepted Dental Remedies

The Council on Dental Therapeutics has announced that because of increased cost in producing and distributing its annual publication, "Accepted Dental Remedies," the price of the book will be increased from $1.00 to $1.50. Substantial discounts will be allowed on purchases of ten or more books.

Nebraska and Vermont Adopt A.D.A. Policy on Advertising and Exhibits

Both the Nebraska and the Vermont State Dental Societies have adopted the uniform standards of the Council on Dental Therapeutics of the American Dental Association governing advertising in official publications and exhibits at meetings, according to recent communications from F. A. Pierson, secretary of the Nebraska society and Francis A. Reid, president of the Vermont society. The standards require that products coming within the scope of the Council on Dental Therapeutics of the American Dental Association must be acceptable to the Council to be exhibited at any meetings or advertised in any of the publications. Thirty-four constituent societies of the American Dental Association have now adopted these standards.

National Research Council Seeks Data on Laboratories

The compilation of the eighth edition of the National Research Council directory, "Industrial Research Laboratories in the United States," is now under way. The seventh edition, which appeared in 1940, contained information concerning the industrial research laboratories of 2,264 companies and their subsidiaries. The term "research," for the purpose of the directory, is construed as including investigations looking toward the improvement of products or the reduction of cost of manufacture, as well as fundamental research and applied research.

Information should be sent to the National Research Council, 2102 Constitution Ave., Washington 25, D. C.

British Naval Dental Chief Appointed Honorary Dentist to King

Surg.-Rear Adm. E. E. Fletcher, chief of the British Naval Dental Corps, has been appointed Honorary Dental Surgeon to the King of England, according to a release from the *British Dental Journal*. Admiral Fletcher visited the American Dental Association Headquarters in Chicago during a recent trip to the United States.

Marcus L. Ward to Retire as Taft Professor at Michigan

Marcus L. Ward, Jonathan Taft Professor, School of Dentistry, University of Michigan, will assume the position of professor emeritus of dentistry when he reaches retirement age on August 5. Since 1902, when he graduated from that school, he has been continuously engaged in dental education and in dental science. From 1916 to 1934, he was dean of the faculty. Dr. Ward has, during these years, led an active and colorful life in the development of dental education and has taken an active part in the affairs of organized dentistry in this country, being president of the Michigan State Dental Society in 1912, of the American Association of Dental Schools in 1925 and of the American Dental Association in 1939.

He has been a keen student of his special field of interest, the chemical and physical properties of dental materials, and has been a voluminous contributor to the literature of this subject. He was editor of and contributor to the "American Textbook of Operative Dentistry." He was the recipient of the Newell Sill Jenkins Memorial Medal, in 1938, the William Jarvis Fellowship Medal, in 1941, the Callahan Memorial Award, in 1942 and the John N. Crouse Memorial Award, in 1943. He is a Fellow of the American College of Dentists, and a member of the International Association for Dental Research, American Association of University Professors, American Association for Adult Education, American Association of the History of Medicine, New York Academy of Dentistry and Michigan Academy of Science and Letters, and of the honorary fraternities of Sigma Xi, Phi Kappa Phi and Omicron Kappa Upsilon.

His retirement from active duties in the school of dentistry will allow him opportunity to devote his energies to several fields of interest, which he will undoubtedly pursue with uninterrupted enthusiasm in the years to come. He will maintain his office in the school of dentistry.

Recipients of honorary degrees at New York University. Back row, third from left, Arthur H. Merritt, Past President of the American Dental Association; front row, second from left, Douglas S. Freeman, editor of The News Leader, Richmond, Va.; fourth from left, Harry W. Chase, chancellor of the university.

Merritt Receives Honorary Degree from New York University

Arthur H. Merritt, Past President of the American Dental Association, was awarded the honorary degree of doctor of science by New York University at its 113th annual commencement exercises June 13 at the university campus in the Bronx. Thirteen thousand graduates, faculty members and guests took part in the exercises, and seven leaders in various fields received honorary degrees from Harry Woodburn Chase, chancellor of the university.

The citation to Dr. Merritt reads: "In this fiftieth anniversary year of yours, we are happy to draw still tighter the bonds which unite you to us as we make public acknowledgement of your distinguished contributions to your profession and confer upon you today the New York University degree of doctor of science."

Hershey and Rowntree Receive Honorary Fellowships

Honorary fellowships were conferred upon Maj. Gen. Lewis B. Hershey, director, and Col. Leonard G. Rowntree, medical director, of the Selective Service System, by the International College of Dentists at a special convocation held in Washington, D. C., June 4. The fellowships were awarded "in recognition of distinguished achievements and contributions to the dental profession and in appreciation of outstanding services rendered to the cause of oral science."

M. Don Clawson, president-elect of the International College of Dentists and president of Meharry Medical College, conferred the fellowships. Outstanding members of the dental profession and officers of the Army and Navy attended the meeting.

New Legislation Proposes Changes in G. I. Bill

A new bill (S. 1176) proposing to amend the Servicemen's Readjustment Act of 1944 with respect to the education and training of veterans has recently been introduced by Sen. Claude Pepper, Florida. The bill proposes to "(1) make benefits available regardless of whether or not education was impeded, delayed, interrupted or interfered with by reason of his entrance into service; (2) remove the requirement that the educational course shall be initiated not later than two years after discharge or termination of the war; (3) remove the distinction between veterans over 25 years at the time of induction and those under this age; (4) add special provisions for qualifying veterans who wish to complete preprofessional and professional courses of education, extending the maximum benefit to seven years regardless of length of service; and (5) increase the monetary dependency benefits to veterans obtaining education."

Senate Passes Bill to Increase Efficiency of Naval Dental Corps

The Senate Committee on Naval Affairs favorably reported the Naval Dental Corps bill, which was then passed by the Senate June 21. The bill now goes to the House of Representatives where hearings will be held by the House Naval Affairs. During the last session of Congress, a similar bill was passed unanimously by the lower house.

The Senate committee's report follows:

The purpose of the bill is to reorganize the Bureau of Medicine and Surgery so as to provide for greater integrity of the dental service of the United States Navy.

Section 1 of the bill directs that this reorganization shall be made within six months after the date of the enactment of the act.

Section 2 provides that the dental functions of the Bureau of Medicine and Surgery shall be defined and prescribed by appropriate directives of such Bureau and by any necessary regulations of the Secretary of the Navy. It provides also that the Dental Division of such Bureau shall study, plan and direct all matters coming within the cognizance of the Dental Division and that all matters relating to dentistry shall be referred to the newly created Division.

Section 3 sets up a Dental Division in the Bureau of Medicine and Surgery and directs that this Division shall (1) establish professional standards and policies for dental practice; (2) conduct inspections and surveys for maintenance of such standards; (3) initiate and recommend action pertaining to complements, appointments, advancement, training, assignment, and transfer of dental personnel; and (4) serve as the advisory agency for the Bureau of Medicine and Surgery on all matters relating directly to dentistry. This section also provides that an officer of the Dental Corps of the Navy shall be detailed as the Chief of the Dental Division and that such officer, while so serving, shall have the rank, pay, and allowances of a rear admiral.

Section 4 directs that the Secretary of the Navy shall provide by regulations that on shore stations and on ships all dental services shall be under the senior dental officer. The proviso to this section directs that this sec-

tion shall not be construed to impose any administrative requirements which would interfere with the proper functioning of battle organizations.

The bill as originally introduced was sponsored by the American Dental Association. Officials of this organization appeared before the committee and stated that, in their opinion, enactment of the bill would increase the morale of naval and dental officers and make the dental service rendered to naval personnel more efficient and effective.

Vice Admiral McIntire, Chief of the Bureau of Medicine and Surgery of the Navy Department, appeared before the committee and stated that, in his opinion, the original bill, if enacted, would not improve the efficiency of the Dental Department of the Navy but, on the contrary, the efficiency of the Medical Department as a whole would be lowered.

Vice Admiral Jacobs, Chief of Naval Personnel, informed the committee that the enactment of the bill as introduced would interfere with the efficient operation of the naval service.

The committee amendment is a compromise between the views as expressed by the Chief of the Bureau of Medicine and Surgery and the officials of the American Dental Association.

The committee are of the opinion that the proposed bill will give the Navy Dental Corps considerably more autonomy and that this will increase the morale of dental officers. The committee believe the proviso in section 4, which states that this section shall not be construed to impose any administrative requirements which would interfere with the proper functioning of battle organizations, will insure that the reorganization directed by the bill will not interfere with the war effort.

Senator Proposes Investigation of Military Hoarding of Dentists

A resolution authorizing the Senate Military Affairs Committee to make an immediate investigation of hoarding of dentists and physicians by the Army and Navy was introduced June 12 by Sen. Sheridan Downey, California. Senator Downey charged that civilians were suffering "unnecessarily" from lack of adequate medical care, while the Army Medical Department is overstaffed. The text of the resolution follows:

Resolved, that the Committee on Military Affairs, or any duly authorized subcommittee thereof, is authorized and directed to make a full and complete investigation with respect to the relative needs of the armed forces and the civilian population for the services of medical personnel with a view to ascertaining (1) whether, as a result of developments in the war, or through more efficient utilization of medical personnel, such personnel can be released from the armed forces for civilian service without impairment of the war effort; (2) the speed with which demobilization of medical personnel in the armed forces can be accomplished as the needs of the armed forces diminish; and (3) whether any further action is necessary to insure an adequate supply of trained medical personnel to meet the future needs of the armed forces and the civilian population of the Nation. The committee shall report to the Senate at the earliest practicable date the results of its study and investigation, together with such recommendations as it may deem desirable.

For the purposes of this resolution, the committee, or any duly authorized subcommittee thereof, is authorized to hold such hearings, to sit and act at such times and places during the sessions, recesses, and adjourned periods of the Seventy-Ninth Congress, to employ such clerical and other assistants, to require by subpena or otherwise the attendance of such witnesses and the production of such correspondence, books, papers, and documents, to administer such oaths, to take such testimony, and to make such expenditures, as it deems advisable. The cost of stenographic services to report such hearings shall not be in excess of 25 cents per hundred words. The expenses of the committee under this resolution, which shall not exceed $——, shall be paid from the contingent fund of the Senate upon vouchers approved by the chairman of the committee.

President Gives Approval to Army Command Legislation

Legislation which gives officers in the Army's Dental Corps the right to command within the Medical Department has been approved by President Truman.

The measure, S. 916, provides for a change in that section of the existing law which stated that officers of the Dental Corps of the Army have no right to command except within that Corps. Although under the new legislation officers of the Dental Corps now have equal command privileges with other officers of the Medical Department, the law is interpreted at the Department as not providing that Dental Officers may command a hospital. Hospital commands are delegated to Medical Corps officers in accordance with Army regulations.

The new law, however, is interpreted as giving Dental Officers the right to command depots and supply centers.

Statement.—The following statement on the new legislation was released by the Dental Division, Surgeon General's Office:

Senate Bill, S. 916, introduced in the first Session of the 79th Congress by Mr. Johnson of Colorado 16 April 1945, became law 30 June 1945. This bill provided for a change of that section of the existing law (Act of March 3, 1917, 36th Stat. 1054) which stated that officers of the Dental Corps of the Army have no right to command except within that corps. No such limitation was placed upon officers of the Medical Corps, the Veterinary Corps, the Pharmacy Corps, the Medical Administrative Corps, or the Sanitary Corps, all such officers being entitled to command within the Medical Department generally.

The Medical Department in 1911 consisted of only two corps, namely, the Medical and the Dental Corps. Dental officers in accordance with this law were commissioned only as first lieutenants, while the medical officers had the higher ranks. There was no vital opposition to the phase of the law which read, "Their right to command shall be limited to the dental corps," by the Dental Corps or the dental profession in 1911. The limitation so imposed upon the Dental Corps has existed throughout all subsequent changes in legislation which affected the Corps. However, this provision was eliminated by the law which was passed 30 June 1945.

Although the officers of the Dental Corps now have equal command privileges with other officers of the Medical Department, this law does not provide that dental officers may command a hospital. Hospital commands are delegated to Medical Corps officers in accordance with Army Regulations.

Professional Training Courses for Army Dental Corps Officers

Refresher professional training has been authorized for officers of the Army Dental Corps who have been assigned to other than professional duties or who have been limited to one phase of dentistry for a year or more. Priority will be given those who have served overseas. This training, which is voluntary, is not intended for dental officers desiring to specialize, but provides about three months' rotation in all phases of general service.

Requests must be initiated by the individual officers concerned and submitted through channels.

It is expected that this training, which will be given in certain general hospitals of the several service commands, will be initiated on a small scale at present, possibly utilizing only a few of the hospitals listed below. Not more than five officer students will be given refresher training at any one hospital at any one time. The hospitals in the various service commands that have been designated to conduct this refresher training include the following:

1st Service Command—Lowell; 2d Service Command—England and Rhoads; 3d Service Command—Woodrow Wilson and Deshon; 4th Service Command—Finney, Kennedy, Lawson, Moore and Oliver; 5th Service Command—Ashford, Billings and Crile; 6th Service Command—Gardner and Percy Jones; 7th Service Command—O'Reilly and Schick; 8th Service Command—Army and Navy, Ashburn, Brooke and Bruns; 9th Service Command—Barnes, Bushnell and Hoff.

Educational Programs Planned for Officers in European Theater

A comprehensive five-point educational program designed to reach officers and enlisted men and women in the European Theater of Operations is now well under way, headquarters, European Theater of Operations, announced this week.

Instructors and administrators for the program have been and are being trained in special staff schools in Paris and in England, and they will operate under the Information and Education Division of the Theater.

Briefly the program consists of: (1) study and training in "unit schools" operated by and within battalions and similar military units; (2) study in civilian educational institutions; (3) study in special Army University Study Centers; (4) training in a centralized vocational school, and (5) study in the Army's system of correspondence schools.

Participation in the Theater Education Program will be on a voluntary basis subject to facilities available and to requirements of military operations. So far as possible, individuals who elect to take advantage of the program will be allowed to pick the field in which they study and to choose specific courses in that field.

Policy Stated on Relief and Redeployment of Dental Officers

The Dental Division, Office of the Surgeon General, has issued the following statement dealing with the relief from active duty and redeployment of dental officers:

Policy.—Many inquiries have been received in the Office of The Surgeon General as to when dental officers would be returned from overseas duty, and when dental officers would be relieved from active duty.

The War Department policies which govern the Medical Corps, the Quartermaster Corps, the Signal Corps, the Engineer Corps, etc., are also applicable to the Dental Corps. The Dental Corps officers are being returned from overseas in the same relative proportion as other Corps and there is no discrimination against dental officers.

The Theater Commander has complete control over the personnel in his command, and the overall policy in one theater may differ from that of another theater because of military necessity. Military needs must have precedence over personal desires.

It is difficult for an officer, who has been overseas many months, or his friends at home, to understand why he should be retained overseas, or why he should be sent to another theater. Such decisions, regarding overseas units, are not made by The Surgeon General's Office, but by the Theater Commander on the basis of the Dental needs of the troops under his command. No doubt, some officers will be required to stay overseas longer than others, and the officers who remain behind will question the justification for such a decision. Redeployment inevitably will create personal advantages for some and disadvantages for others. It is physically impossible for a Theater Commander to make decisions which affect millions of men without creating situations which are an extreme handicap to some.

Dental officers continually are being returned from overseas to the United States. The rapidity of redeployment and likewise the rate dental officers will be relieved from active duty cannot be estimated at this time. However, dentistry will be represented proportionately in any program.

New Promotions Listed in Army Dental Corps

Lt. Col. James S. Pegg, DC, Regular Army, who has been promoted to the grade of colonel, heads a number of promotions involving officers of the Army Dental Corps. Colonel Pegg is on duty with the 142d General Hospital. Two other Regular Army Dental Corps officers, Maj. Wynn L. Beebe, on duty at the Army Ground and Army Service Forces Redistribution Station, Miami Beach, Fla., and Maj. Glynn B. Widner, on duty with the 196th General Hospital, have been promoted to the grade of lieutenant colonel.

Other Dental Corps officers promoted from major to the grade of lieutenant colonel include the following: William B. Irby, 250th Station Hospital; Newton J. Krabbe, Chanute Field, Ill.; William F. Peacock, 150th Station Hospital, and Eugene W. Gray, Jr.

Acquit Firms in Acrylic Resin Monopoly Case

A jury in federal court in Newark, N. J., June 20, according to a report by the United Press, acquitted Lammot du Pont, chairman of the board of E. I. du Pont de Nemours & Co., Inc., of Wilmington, Del., the corporation and three of its officers of charges of violating the antitrust act.

The Rohm & Haas Co., Inc., of Philadelphia and two officers of that corporation, who were tried jointly, also were acquitted.

The defendants, who went on trial five and a half weeks ago, were charged with having conspired with Rohm & Haas, of Darmstadt, Germany; Imperial Chemicals Industry, Ltd., of London, and I. G. Farbenindustrie Aktiengesellschaft, of Germany, to eliminate competition in the manufacture and sale of acrylic products, to restrict production in the United States and to charge exhorbitant prices.

Illinois Oral Hygienist Bill Awaits Governor's Signature

The Illinois Oral Hygienist Bill (H.B. 694) has been passed by the Illinois legislature and is now in the hands of Gov. Dwight H. Green awaiting signature. The bill provides for the licensing of dental hygienists in the state of Illinois and defines the duties and restrictions of the licensed hygienist. The legislation was introduced in the House May 17 by Representatives Kelly, Hunter, Lavezzi, Downey and Shaw.

Urge Expansion of Federal Program for Child Care

A recommendation has been presented to President Truman for immediate expansion of health, welfare, education and other federal-state services for children with an additional $75,000,000 appropriation for the fiscal year 1946. The recommendation was made at the conclusion of a year's study by the National Commission on Children in Wartime, according to the *New York Times*. A $50,000,000 addition to the current $6,000,000 grants-in-aid appropriation to the states for maternal and child health services was recommended, this sum to be broken down into a $10,000,000 dental care program for young children, a $15,000,000 school health program and a $25,000,000 program for the care of mothers, infants and preschool children. A $25,000,000 increase over the less than $4,000,000 in current yearly grants for crippled children's services was asked, $15,000,000 of which would go to the victims of rheumatic fever and heart disease, which kill and cripple more grade school children than any other condition except accidents; the rest to be divided equally between orthopedic and other types of crippling such as diabetes, allergies and epilepsy.

Dental Health Council Adds Two to Physical Fitness Committee

Two persons representing national organizations interested in child health have been added to the list of consultants to the Physical Fitness Committee of the Council on Dental Health of the American Dental Association. They are Mrs. James C. Parker, Grand Rapids, Mich., president of the Michigan Congress of Parents and Teachers, and Frank C. Neff, Kansas City, Mo., representing the American Academy of Pediatrics.

North Carolina Passes Dental Hygienist Bill

The North Carolina legislature recently passed a bill (H.B. 312), licensing dental hygienists. The bill has become a law without the governor's signature since the governor does not have the power of veto in North Carolina. The legislation was introduced February 9 by Representative Hutchins.

U. S. Public Health Service Obtains Military Status

President Truman has by executive order given 3,000 U. S. Public Health Service members military status for the duration of the war. This action was taken under authority of the Public Health Service Act of 1944 and was effective July 21. The Public Health Service has no enlisted personnel, and its commissioned corps of around 3,000 includes physicians, dentists, sanitary engineers, pharmacists and other scientists and nurses. The President's order gives this personnel the same status, benefits, discipline and obligations as members of military establishments and provides uniformity in status and in discipline as between various members of the U. S. Public Health Service commissioned corps. Formerly some officers acquired veteran status while others did not, according to their assignments. The order does not transfer administration of the Public Health Service either to the Army or to the Navy.

Montana State Society Joins Public Health League

The Montana State Dental Association has voted recently to join the Public Health League of Montana. Harvey Fearn, Bozeman, has been named to represent the state association on the league's board of directors.

The Public Health League, which has headquarters in Helena, is a state nonprofit organization to protect the public health. It utilizes the cooperation of existing health agencies, dentists, physicians, optometrists, pharmacists, nurses and research workers. Other organizations represented in the league are the Montana Medical Association, Montana Hospital Association, Catholic Hospital Association, Montana State Nurses Association, Montana Optometric Association, Montana Pharmaceutical Association, Blue Cross Hospital Service Association of Montana, Montana Tuberculosis Association of Montana Field Army of the American Cancer Society.

Pennsylvania Launches Dental Health Education Program

The Pennsylvania State Council on Dental Health recently launched a widespread program of dental health education for children and adults. To initiate the state-wide campaign, the council has sent a copy of the American Dental Association's booklet "Your Child's Teeth" to every member of the state society. The council hopes also to distribute the booklet to teachers, parents and visiting nurses to encourage dental care for children.

Copies of the booklet can be obtained by addressing the Bureau of Public Relations, American Dental Association, 222 E. Superior St., Chicago 11, Ill.

Lloyd Beers, Dental Chief of Veterans Administration, Dies

Lloyd Y. Beers, for many years chief of the Dental Division, U. S. Veterans Administration, died suddenly July 11. He was a graduate of George Washington University, class of 1911. A more extensive obituary notice will appear in a later issue of THE JOURNAL.

BUREAU OF PUBLIC RELATIONS

Exhibit on Mouth Cancer Offered to Dental Societies

A new exhibit on cancer of the mouth, designed primarily for use at state and local dental meetings, has been completed by the Bureau of Public Relations of the American Dental Association. The exhibit consists of sixteen color enlargements illustrating mouth cancer cases and stresses the dentist's responsibility in recognizing and diagnosing early cancer lesions of the mouth and lips. The original kodachrome photographs were furnished by L. V. Ackerman, of the Ellis Fischel State Hospital. Hamilton B. G. Robinson, who is the chairman of the Scientific and Health Exhibit Committee, arranged the exhibit layout after consultation with representatives of the American Cancer Society.

Dental societies can obtain bookings of the exhibit by writing to the Bureau of Public Relations of the American Dental Association, 222 E. Superior St., Chicago 11, Ill.

Army Dental Surgeons Meet in European Theater

Nearly 100 U. S. Army dentists convened recently at the 21st General Hospital for a two-day session to discuss developments in various phases of dentistry. It was the first meeting of its kind in the European Theater of Operations. Speakers at the meeting included Capt. Robert I. Mason, Yonkers, N. Y.; Lt. Col. Moses S. Strock, Newton, Mass.; Maj. Ellery C. Gay, Little Rock, Ark.; Lt. Col. Maurice J. Hickey and Lt. Col. Kermit L. Allen, North Tonawanda, N. Y., and Maj. Lane W. O'Brien, St. Louis, Mo.

CANCER OF THE MOUTH
ORAL CANCER IS A DENTAL PROBLEM
ORAL CLEANLINESS HELPS PREVENT
EARLY LESIONS MAY BE CURABLE
EARLY DIAGNOSIS HELPS SAVE LIVES
AMERICAN DENTAL ASSOCIATION
LATE CANCER IS DIFFICULT TO TREAT

Bureau of Public Relations exhibit on cancer of mouth.

DEATHS

Allison, Cyrus N., Falls City, Nebr.; Western Dental College, Kansas City, 1905; died May 27; aged 65.

Arneson, Odell T., Cochrane, Wis.; University of Illinois, College of Dentistry, 1919; died May 22; aged 47.

Baechler, Andrew E., Momence, Ill.; died June 10; aged 75.

Bookwalter, Glenn J., Indianapolis, Ind.; Indiana University School of Dentistry, 1900; died May 24; aged 67.

Boozer, John Reuben, Newberry, S. C.; Atlanta-Southern Dental College, 1934; died June 14; aged 39.

Bourne, A. Rutherford, New York, N. Y.; New York College of Dentistry, 1898; died March 31.

Broude, David, Minneapolis, Minn.; University of Minnesota, College of Dentistry, 1922; died June 2; aged 47.

Brown, Fidelio F., Chicago, Ill.; American College of Dental Surgery, Chicago, 1892; died May 28; aged 75.

Brown, W. W., Neosho, Mo.; Washington University School of Dentistry, 1908; died April 23; aged 61.

Carter, Charles D., Palmer, Alaska; Harvard University Dental School, 1904; died May 3; aged 66.

Chapin, Wayne H., Silver City, N. M.; Kansas City Dental College; died May 13; aged 62.

Chaudet, Louis S., St. Louis, Mo.; Washington University School of Dentistry, 1906; died April 20; aged 65.

Cook, Joseph R., Paterson, N. J.; Temple University School of Dentistry, 1915; died June 18; aged 61.

Cooke, Augustus R., Syracuse, N. Y.; Philadelphia Dental College, 1884; died April 17; aged 85.

Cruise, Joseph V., New York, N. Y.; School of Dental and Oral Surgery, Columbia University, 1925; died April 3.

Curran, Paul Clayton, La Crosse, Wis.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1902; died May 17; aged 71.

Dobosh, Michael A., Lansford, Pa.; died May 13 at Walter Reed Hospital, Washington, D. C.; aged 44. Dr. Dobosh was a captain in the United States Army Dental Corps.

Draper, C. A., Palo Alto, Calif.; died June 16; aged 81.

Faucett, Glenn E., Falls City, Nebr.; Kansas City-Western Dental College, 1920; died April 23 at San Antonio, Texas. Dr. Faucett was a lieutenant colonel in the United States Army Dental Corps.

Feamster, J. H., Frankfort, Ky.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1903; died June 17; aged 67.

Fintz, Morris M., Philadelphia, Pa.; Pennsylvania College of Dental Surgery, 1909; died May 23; aged 59.

Foley, J. G., Pineville, Ky.; Tennessee Medical College, Dental Department, 1892; died June 12; aged 82.

Ford, Joseph Downing, Newport News, Va.; died June 11; aged 74.

Gaston, Robert Woodward, Sr., New Orleans, La.; Louisville College of Dentistry, 1901; died May 24; aged 65.

Guthridge, M. H., Oakland, Calif.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1886; died May 29; aged 85.

Harris, Michael B., Newark, N. J.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1909; died June 17.

Hollingsworth, Robert M., Carmel, Calif.; died May 21; aged 70.

Howard, E. C., Cairo, Ill.; Meharry College, Dental Department of Meharry Medical College; died May 18; aged 47.

Jennings, Irving H., Danville, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1883; died May 22.

Johnson, Carroll C., Memphis, Tenn.; died June 13; aged 55.

Johnston, W. F., New York, N. Y.; died April 9.

Jones, Joseph P., Mt. Pleasant, Pa.; died May 20; aged 41.

Jordan, Robert F., Upper Sandusky, Ohio; died June 6; aged 93.

Keenan, Orren Rea, Edwardsville, Ill.; St. Louis University School of Dentistry, 1915; died May 31; aged 54.

Kern, W. S., Toledo, Ohio; Chicago College of Dental Surgery, Dental Department of Loyola University, 1898; died June 9.

Kruse, Edward H. L., Newark, N. J.; New York College of Dentistry, 1919; died June 7; aged 51.

Ladd, Lawrence A., North Adams, Mass.; Baltimore College of Dental Surgery, 1901; died June 13; aged 69.

Lata, John A., New York, N. Y.; died in February.

Lemley, Ira, Sisterville, W. Va.; Ohio College of Dental Surgery, Dental Department of the University of Ohio, 1901; died May 14; aged 72.

Lenz, Frank J., Seattle, Wash.; University of Minnesota, College of Dentistry, 1912; died May 18; aged 62.

Longnecker, Parke Lewis, Philadelphia, Pa.; Philadelphia College of Dental Surgery, 1892; died May 20; aged 73.

McCormack, Charles V., Chicago, Ill.; Baltimore College of Dental Surgery, 1909; died May 12; aged 62.

McEvoy, Richard David, Missouri Valley, Iowa; Chicago College of Dental Surgery, Dental Department of Loyola University, 1900; died May 27; aged 75.

Mackay, Gurdon R., Shelburne, Nova Scotia; Philadelphia Dental College and Garretson Hospital of Oral Surgery, 1888; died June 6.

Markle, Albert M., Chicago, Ill.; Temple University School of Dentistry, 1887; died May 26; aged 88.

Martin, J. H., Minneapolis, Minn.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1914; died June 7.

Mason, W. W., Covington, Tenn.; died February 15.

Masterson, Charles H., Las Vegas, Nev.; College of Physicians and Surgeons of San Francisco, 1911; died recently.

Modie, Clyde R., Missoula, Mont.; Ohio Medical University, College of Dentistry, 1901; died February 27; aged 70.

Motch, H. E., Middlesboro, Ky.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1904; died June 8; aged 72.

Moxness, Elmer B., Foley, Minn.; died May 26; aged 47.

Mulhearn, F. Richard, Providence, R. I.; Georgetown University, School of Dentistry, 1904; died June 2; aged 66.

Newman, Dwight W., Edgewood, Iowa; State University of Iowa, College of Dentistry, 1916; died May 8.

Nystrom, Egnar W., Chicago, Ill.; Northwestern University Dental School, 1913; died June 22; aged 50.

Olson, Axel, Fergus Falls, Minn.; Northwestern University Dental School, 1907; died May 8; aged 65.

Patterson, Clayton G., Genoa, Ill.; Chicago Dental College, 1898; died May 21; aged 73.

Peters, Andrew, Livingston, Texas; died May 4 at Camp Maxey, Texas; aged 52. Dr. Peters was a captain in the United States Army Dental Corps.

Phillips, W. J., La Crosse, Wis.; Marquette University, School of Dentistry, 1905; died June 6; aged 65.

Place, Eugene H., Freeport, Ill.; Thomas

W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1888; died April 14; aged 75.

Pound, Benjamin F., Salem, Ore.; North Pacific College of Oregon, School of Dentistry, 1910; died May 10; aged 57.

Proctor, William Eppes, Sheffield, Ala.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1886; died May 24; aged 82.

Ray, Frederick Nash, Haverhill, Mass.; died April 12; aged 73.

Reynolds, Stanley S., De Ruyter, N. Y.; Pennsylvania College of Dental Surgery, 1906; died April 12; aged 60.

Richards, F. T., Janesville, Wis.; University of Louisville, School of Dentistry, 1889; died June 3; aged 77.

Rieman, Soloman, Bayonne, N. J.; New York College of Dentistry, 1916; died May 26; aged 48.

Sattler, George J., Buffalo, N. Y.; died May 31; aged 62.

Sesso, George A., Washington, D. C.; School of Dentistry, Georgetown University, 1941; killed in Italy, December 20, 1944. Dr. Sesso was a captain in the United States Army Dental Corps.

Sharkey, James H., Jersey City, N. J.; Georgetown University, School of Dentistry, 1921; died June 18; aged 46.

Skill, Theodore A., Jamaica Plain, Mass.; died June 6; aged 57.

Sprake, William T., Seattle, Wash.; died June 3; aged 81.

Stagg, Marcellus McDavitt, Rayne, La.; Atlanta Dental College, 1901; died May 10; aged 72.

Stassel, Earl A., Racine, Wis.; died May 30; aged 55.

Swentzel, John B. L., Yonkers, N. Y.; Baltimore College of Dental Surgery, 1887; died June 17; aged 88.

Thuerer, George T., Baraboo, Wis.; University of Michigan, College of Dental Surgery, 1890; died June 15; aged 75.

Torrence, L. Burett, Chester, Ill.; Vanderbilt University, 1890; died May 13; aged 81.

Trythall, John, Faith, S. D.; Northwestern University Dental School, 1905; died May 14.

Walty, Ralph L., Springfield, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1916; died May 21; aged 58.

Waugaman, Edwin A., Avalon, Pa.; University of Pittsburgh, School of Dentistry, 1899; died in February.

Werntz, J. O., Moose Lake, Minn.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1903; died May 19; aged 72.

Westlake, Albert, New York, N. Y.; Harvard University Dental School, 1888; died May 1.

Will, Joseph K., Houston, Texas; Western Dental College, Kansas City, 1897; died April 8.

Williams, C. H., De Soto, Mo.; Washington University School of Dentistry, 1888; died April 16; aged 84.

Wilson, Myron W., Washington, D. C.; George Washington University, Dental Department, 1916; died April 23; aged 57.

Zeller, Christian M., Yellow Springs, Ohio; Cincinnati College of Dental Surgery, 1897; died May 23; aged 75.

Zeluff, Czar E., Clyde, N. Y.; University of Buffalo, School of Dentistry, 1902; died May 27.

Zuver, Fred Arnold, Ft. Pierce, Fla.; University of Pittsburgh, School of Dentistry, 1921; died May 16; aged 47.

CURRENT LITERATURE

Cases of Acute Oral Lesions Treated with Penicillin. A. D. McIntyre. Brit. D. J. 78:262-266, May 4, 1945.

The author reports that penicillin has been successfully used in treating root canals and in Vincent's infection and osteomyelitis of the mandible. Root canals are irrigated with a penicillin solution, and paper points soaked with the drug are sealed in the canal. Vincent's infection is treated with topical applications of a penicillin solution. Intramuscular injections of 15,000 units of penicillin every three hours successfully controlled a case of osteomyelitis of the jaw in three days. After removal of sequestra, penicillin can be applied locally by means of rubber tubes and through and through drainage.—*Paul H. Keyes.*

Vincent's Infection a Wartime Disease. Observations on the Oral Spirochetal Flora Present in Vincent's Infection. E. G. Hampp. Am. J. Pub. Health 35: 441-450, May 1945.

Observations of spirochetes obtained from pure cultures and from oral lesions reveal the unreliability of the stained smear for the identification of oral spirochetal species. Stained preparations make fine structural details, produce distortion of smaller treponemes and cause shrinkage of oral borrelia. When examined by dark-field illumination, the organisms can be identified with little difficulty.—*Paul H. Keyes.*

Vincent's Infection. A Wartime Disease. Reporting of Vincent's Infection by State Health Departments. Carl L. Sebelius. Am. J. Pub. Health 35:451-456, May 1945.

Vincent's infection is inadequately reported and the clinical picture of the disease is neither clear nor consistent. If ulcerative gingivitis is to be a reportable disease and the data received are to be comparable, a better understanding of the clinical picture as well as the epidemiologic and bacteriologic aspects of the disease will be necessary.—*Paul H. Keyes.*

Preliminary Bite-Wing Roentgenographic Examination of Naval Aviation Cadets. D. P. White. U. S. Naval M. Bull. 43:901, November 1944.

Bitewing examinations were made of 256 Naval Air Cadets (20 years average age) who had previously been examined with mirrors and explorers and had had all carious areas restored. A supplemental survey of 544 additional cadets was made in the same manner. A high degree of correlation between the findings in the two groups was found. The findings among the 800 cadets studied were as follows: (1) caries-free, twenty-five (3 per cent); (2) operative and surgical rehabilitations required, 104 (13 per cent); (3) total number of impacted teeth, 450; (4) total number of pulpless teeth, forty-seven; (5) total number of carious areas, 3,582 (4.4 per person), 583 of which occurred beneath prostheses. Fifty-six per cent of cadets had 1.4 areas each that required immediate attention.—*J. E. Gilda.*

Effect of Cadmium and Fluorine on the Rat Dentition. J. T. Ginn and J. F. Volker. Proc. Soc. Exper. Biol. & Med. 57:189, November 1944.

At weaning, four groups of rats each containing eighteen litter mates were placed on a modified Hoppert-Webber-Canniff diet in which rice was substituted for the coarse corn supplement. Group 1 served as a control. Groups II, III and IV were maintained on the same diet, but received 50 parts per million of cadmium ($CdCl_2$) in the food, 50 parts per million of cadmium in the water and 50 parts per million of sodium fluoride (NaF) in the water, respectively. The incisor teeth were examined periodically for mottling. Hemoglobin values were determined at definite intervals. At the end of 150 days, the animals were killed and the

teeth examined for evidence of caries. The ability of cadmium to diminish the degree of pigmentation of rat incisor enamel and to effect a reduction in blood hemoglobin was confirmed. Administration of fluoride was also found to bring about a comparable reduction in blood hemoglobin. It is suggested that the pigmentary changes in the enamel and the fall in hemoglobin that results from the ingestion of both cadmium and fluoride is related to the ability of these elements to interact with iron-containing proteins. Unlike fluoride, cadmium in the concentration studied is ineffective in reducing experimental rat caries.

Vincent's Infection—A Wartime Disease. Preliminary Consideration on the Epidemiology of Ulcerative Gingivostomatitis. H. T. Dean and D. E. Singleton. Am. J. Pub. Health 35:433-440, May 1945.

From a survey of Vincent's infection among personnel of the U. S. Coast Guard and U. S. Maritime Service Training services, the authors conclude that (1) the epidemiology of ulcerative gingivostomatitis is still confusing and largely undefined, and a searching epidemiologic inquiry is urgently needed; (2) the seasonal fluctuations in rates of prevalence must be interpreted with caution, and (3) relatively few cases involve the throat. From the standpoint of medical and dental care, treatment is almost entirely an outpatient dental problem. Prophylaxis with scaling at the first sitting and use of bland medicaments in conjunction with full patient cooperation was effective in restoring gingival health.—*Paul H. Keyes.*

Studies on the Growth and Development of Male Children Receiving Evaporated Milk. T. F. Rhoads, M. Rapoport, R. Kennedy and J. Stokes. J. Pediatrics 26:415-454, May 1945.

In 1936, a study was undertaken to determine the adequacy of irradiated evaporated milk for growth and development. The present report covers physical growth, dentition and mental development of white and Negro children through the first four years as influenced by the administration of vitamin supplements. Children were divided into groups to determine the adequacy of vitamin D in irradiated evaporated milk as compared with accepted dosages of cod liver oil and to determine whether additional vitamin A and B complex are necessary when evaporated milk constitutes the entire milk supply.

Various criteria for growth and nutrition indicate that evaporated milk is nutritionally adequate as a continuous milk source for growing children. Its acceptibility as a continuous milk source through the age of 5 years was shown. Statistical analyses of data revealed no significant differences between groups that could be attributed to variations in vitamin D intake or supplements of vitamin A or B complex.

The variation in vitamin D intake as well as supplementation with vitamin A and B complex showed no consistent effect on such developmental observations as closing of the anterior fontanel, age of walking alone, age at tooth eruption, etc. Measurement of the intelligence quotients at 3 years revealed no differences between groups. Incidence of dental caries was low in all groups as compared with reported studies of comparable children. Dental examinations at 4½ to 6 years showed a mean number of 2.88 carious teeth per child and 28 per cent of caries-free mouths. The Negro children had a lower incidence of dental caries.—*Paul H. Keyes.*

Carcinoma of the Cheek, Alveolar Processes, Floor of the Mouth and Palate. R. H. Beiswanger and K. W. Stenstrom. Radiology 44:213, March 1945.

In a study of 129 cases of carcinoma of the alveolar process, cheek, floor of the mouth and palate with positive biopsy, the five-year survival rate of 24 per cent compares favorably with survival rates reported from other clinics. In addition, the survival rates for each site are reported separately and various data relating to treatment complications, etc., are included. By the proper use and control of irradiation alone, or irradiation and surgical measures combined, good results can be obtained in lesions of stage 1 (under 1.5 cm. in diameter), stage 2 (over 1.5 cm. in diameter, but no local extension) and stage 3 (local extension but no metastases). Sixty-one per cent

of stage 2 lesions and 60 per cent of stage 3 lesions were controlled for from one to five years. Better results can be expected in the future: (a) for the primary lesion, from the increased use of direct intra-oral therapy in combination with the present methods of irradiation and possibly by the more generalized use of higher kilovoltages up to 500; (b) for cervical metastases, from possibly more vigorous irradiation in combination with surgical measures for operable metastases and by more localized and therefore more intense irradiation of inoperable metastases; (c) in general, from education of the public, dentist and physician in regard to early recognition of the malignant lesion.

A Clinical Evaluation of Local Anesthetic Solutions of Increased Strength. Leo Winter and M. L. Tainter. Am. J. Orthodontics 31:307, June 1945.

Observations on volume of solution required, onset time of anesthesia, grade of anesthesia, duration of anesthesia, blood pressure changes, pulse rate changes, amount of bleeding and patient reaction were made and data obtained by the use of four isotonic anesthetic solutions on 2,382 patients. These solutions were: procaine 2 per cent with epinephrine 1:50,000; procaine 2 per cent with cobefrin 1:10,000; procaine 3 per cent with epinephrine 1:50,000, and procaine 2 per cent, pontocaine 0.15 per cent and cobefrin 1:10,000. Following are the conclusions:

1. The longest anesthesia occurred with a combination of procaine 2 per cent, pontocaine 0.15 per cent and cobefrin 1:10,000.

2. The procaine-pontocaine combination and the procaine 3 per cent both required a smaller volume to produce satisfactory anesthesia than did either of the other two.

3. The differences in the degree of anesthesia produced by administration of the four solutions were not clinically important. All four gave generally satisfactory anesthesia.

4. Administration of the two solutions containing cobefrin appears to produce slowing of the pulse rate, whereas with the two solutions containing epinephrine an increase resulted.

5. The changes in both diastolic and systolic pressure are small for all of the solutions studied. No significant differences among the solutions as regards the circulation were found except that two of the solutions produced a slightly higher pulse pressure than did the others.

6. In general, freer bleeding occurred with the three test solutions than with the reference solution (procaine 2 per cent with epinephrine 1:50,000).

7. When considered from the standpoint of no reactions, perspiration, nervousness, tremor, tears and embarrassment of respiration, it can be seen that (a) procaine 3 per cent with epinephrine differs from the reference solution in being somewhat less well tolerated and (b) adding 0.15 per cent pontocaine to the procaine cobefrin mixture does not increase, but possibly even decreases the incidence of reactions.

8. Each of the four solutions is a satisfactory anesthetic for the types of clinical procedures included in this investigation.—*S. Wah Leung.*

Osteoporosis Circumscripta Cranii: Its Pathogenesis and Occurrence in Leontiasis Ossea and in Hyperparathyroidism. F. Windholz. Radiology 44:14, January 1945.

Osteoporosis circumscripta (Schüller) is described in the skull of a woman aged 63 suffering from leontiasis ossea (type Virchow). Ten years before admission, the maxilla had begun to grow thicker. Several sinus operations were performed and a number of teeth were extracted. The patient believed that each instrumentation aggravated the condition and increased the size of the maxilla. When seen, the maxilla was greatly enlarged and the gingiva appeared to cover almost entirely the few remaining teeth. Photomicrographs revealed osseous changes in the alveolar bone. Osteoporosis circumscripta is also reported in the skull of a woman aged 56 years old with hyperparathyroidism. The "primitive" form of the condition described is a characteristic reaction of the bones of the cranium probably caused by circulatory disturbances in the presence of bony hyperplasia or of bony tumors near the base of the skull.—*J. Edward Gilda.*

Treatment of Ambulatory Patients with Penicillin Sodium. Preliminary Studies of Fusospirochetosis. W. F. Pearce and J. B. McDonald. J.A.M.A. 128:342, June 2, 1945.

In fifty male patients between the ages of 18 and 35 suffering from fusospirochetosis (twenty-nine with Vincent's angina, sixteen with Vincent's infection and five with both conditions), the diagnosis was established on the basis of definite clinical and laboratory criteria. All were treated with intramuscular injections of penicillin sodium in doses of either 10,000 or 20,000 units every two or three hours night and day until a total of 100,000 to 200,000 units had been given. In some cases, hydrogen peroxide mouthwashes followed the penicillin. Another group received local dental therapy. All patients remained ambulatory during the treatment. In many cases, all spirochetes had disappeared from smears after 70,000 units had been given, and in no instance were spirochetes found after 100,000 units had been administered. All patients were symptom free within twenty-four hours after first injections. In the great majority of cases, the gingiva and tonsils became clinically well in forty-eight to ninety-six hours. The most satisfactory results were obtained in that group receiving 10,000 units every two hours (until 100,000 units had been given) followed by a hydrogen peroxide gargle and, in cases of stomatitis, accompanied by local dental therapy. No control group treated entirely by local dental measures was reported. It is stated that older methods of treatment required daily care and observation for a minimum of ten days and usually much longer. Follow-up studies were undertaken at weekly intervals without clinical or bacteriologic evidence of recurrence.—*J. Edward Gilda.*

Immunization of Human Beings with Oral Lactobacilli. By Ned B. Williams. J. D. Res. 23:403, December 1944.

An equal mixture of two widely cross-agglutinating organisms, among stock strains of oral lactobacilli, was used for subcutaneous inoculation of twenty human volunteers, once weekly for a period of four weeks. Heat-killed as well as living types of vaccine were injected simultaneously in opposite arms. No outstanding differences were observed between the type of responses to living and heat-killed vaccines. Both were characterized by soft pink areas, which disappeared in four or five days without induration or abscess formation. Agglutination tests between sera and vaccine strains demonstrated that increases in titers were maximal from two weeks to one month after vaccination. Later, there was a gradual decrease until, at five months, only a few showed titers above their previous "normal" levels. Tests, under similar conditions, of thirteen unvaccinated controls demonstrated no changes in their titers. Salivary counts for oral lactobacilli were averaged before and after for persons in the vaccinated as well as in the unvaccinated groups. Statistical analysis of the averages in the former group revealed that five of the twenty had reductions in count greater than could be accounted for on the basis of chance. Among the remaining fifteen in this group, six showed an increase in count and the others had reductions within the limits of chance variation. No significant differences were observed in the control group. Dental examinations, supplemented by bitewing films, before vaccination as well as three and six months after, gave no evidence of any changes in the dental health of the groups. On the basis of these findings and within the limits of the study, it is concluded that the salivary counts for lactobacilli are not appreciably affected by the increased blood agglutinin titers following subcutaneous injection of oral lactobacillus vaccines.—*Ned B. Williams.*

Incidence of Gingivitis in the Royal Air Force. By G. A. Smart. Brit. M. J. 2: 242, August 19, 1944.

A survey of the gums of random samples of airmen and airwomen (1,204) from four Royal Air Force stations led to an arbitrary classification of gingivitis. The incidence was approximately 40 per cent, higher among those susceptible in the older age groups and in those recruited from the poorer social classes. Length of service in the R.A.F. did not seem to influence the incidence. Significant differences were found among the various trade groups, the incidence being lower

among those who were more highly paid. —*J. E. Gilda.*

Incidence of Bleeding Gums Among R.A.F. Personnel and the Value of Ascorbic Acid in Treatment. By W. P. Stamm, T. F. Macrae and S. Yudkin. Brit. M. J. 2:239, August 19, 1944.

On examination, 588 (19.8 per cent) of 2,962 R.A.F. personnel were found to have some degree of bleeding of the gums, the incidence found during the autumn and spring seasons and at each of the four stations where the investigations were carried out being similar. The average amount of ascorbic acid present in the food served to airmen at three of the R.A.F. stations was 25.8 mg. per man daily during October and November 1941, and 16.8 mg. during March 1942. The amount considered desirable by the Health Organization of the League of Nations is 30 mg. daily. It might reasonably be expected that if gingivitis were an early sign of ascorbic acid deficiency, a noticeable proportion of those with bleeding gums would have shown improvement with ascorbic acid treatment. No greater improvement in the gum conditions was obtained by treatment with ascorbic acid than with dummy control tablets. Observation of 600 personnel over a six weeks period showed that there was a large normal variation in the degree of bleeding of the gums, irrespective of treatment, although the total incidence of bleeding gums remained constant. This may well be the explanation of apparent success in treatment with ascorbic acid that has been so often reported. Those having "sponginess" as well as bleeding of the gums showed no greater improvement with ascorbic acid treatment than with dummy tablets, although there was less normal variation in their condition. The personal opinion of the patient as to the efficacy of treatment bore no relation to the objective signs.—*J. E. Gilda.*

Sclerosing Agent in Treatment of Subluxation of Mandible and of Hemangiomas of Mouth. By Irving Salman. U. S. Nav. M. Bull. 44:361, February 1945.

A series of ten cases of subluxation of the temporomandibular joint were treated by the injection into the joint of a sclerosing solution, a 5 per cent sodium psylliate mixed with an equal part of 2 per cent procaine hydrochloride or eucupine in oil. From 0.25 to 0.5 cc. of the solution is injected inside each capsule for each treatment. The mixture used will minimize the postoperative pain. It is recommended that injection be made into both joint cavities even if the symptoms are present only in one joint. If favorable results are not obtained with the first treatment, injection may be repeated every week or ten days. Usually, four or five injections are the maximum number required. Hemangioma of the oral cavity is treated by injecting a sclerosing solution into the tumor.—*S. W. Leung.*

Distribution of Organic Matrix of Enamel in Human Tooth and Its Relation to the Histopathology of Caries. By H. E. Frisbie, J. Nuckolls and J. B. de C. M. Saunders. J. Am. Coll. Dentists 11:243, September 1944.

The more precise histologic technic for the complete fixation and subsequent decalcification of enamel described has been used to demonstrate the existence of a complete matrix in the adult human tooth and to show that the adult matrix retains the essential structure of that laid down during development.

Once the primary cuticle is destroyed, the primary lesion of caries appeared to be proteolysis of the matrix. Continued proteolysis results in the exposure of individual rods or groups of rods. The pathways of penetration are narrow, irregular tracts, which may resemble the classically described lamellae. Gram-positive spheroidal organisms were found deep in the matrix, well beyond the general area of decomposition. With expansion of the tract, secondary organisms of diverse structures make their appearance. The authors believe that caries is more than simple decalcification and removal of inorganic salts. They present the hypothesis that, with the establishment of the lesion, caries of the enamel is primarily a proteolysis of the organic matrix resulting from the enzymatic action of micro-organisms followed by the subsequent dissociation of the inorganic constituents.—*J. E. Gilda.*

The Junior College and Dental Education. By Walter C. Eells. Junior Coll. J. 15:297-302, March 1945.

The author has surveyed a large number of junior colleges and tells how the present junior colleges are able to meet the predental requirements of students. He finds also that a number of junior college graduates have entered the dental schools. With a view to a long-term program and the possibility that the junior colleges will improve their service to the dental schools, he asks whether the dental schools will continue to require only a two-year course or whether, as time goes by, they will urge a lengthened course, thereby reducing the usefulness of the junior college as a preparatory unit. The author goes on to suggest that educational research be conducted to show whether more than two years is necessary or even desirable. He points out a number of other questions and problems that had been proposed by the colleges. Some wanted more publicity for the opportunities in dentistry; others wanted adequate aptitude tests, and others wanted more audiovisual aids in this program. They also thought that the "junior colleges should expect to establish and maintain a functioning public relations program with regional and state dental associations," adding that the use of these relationships "will greatly improve and modify course and curricula in content, method and procedures."

The author also raised the question as to whether the dental schools would prefer to train their own dental assistants or let the junior colleges render this service.

Leukocytes in the Epithelium. By Balint Orban. J. D. Res. 23:459, December 1944.

Leukocytes often invade the epithelium of the surface, as well as the epithelium that has proliferated into the deeper regions, even if the surrounding connective tissue is in a state of chronic infiltration. This accumulation of leukocytes is most probably due to some chemotactic influence from toxins penetrating from the surface or developing in the epithelium as a result of degeneration of the epithelial cells.

Estimation of the Rate of Spread of Dental Caries. By P. R. Shepherd. Brit. D. J. 78:73, February 2, 1945.

The bitewing film is a reliable means of diagnosing the presence of interproximal cavities and, by an extension of this method, of measuring the rate of spread of the carious process. A series of bitewing films is taken over a period of time. The films are projected on to graph paper at a magnification of about 10 diameters. The carious cavity is outlined and the included squares counted. The area of the cavity at various time intervals is thus measured with some degree of accuracy. The results may be tabulated or graphed. Errors in roentgenographic technic can be overcome with reasonable care. Errors in outlining the cavity upon the paper can be minimized by taking films at bimonthly or trimonthly intervals.—*J. E. Gilda.*

Radioactive Phosphate Absorption by Dentin and Enamel. By G. Bevelander and M. H. Amler. J. D. Res. 24:25, February 1945.

A comparison of the relative absorption of radioactive phosphorus by enamel and the several morphologic and topographic varieties of dentin was ascertained in dog and in human teeth. Both *in vitro* and *in vivo* preparations show a direct relationship between the variation in the structure of dentin and the absorption of radioactive phosphorus. This relationship is inversely proportional to the density of dentin. Relative absorption rates for *in vivo* and *in vitro* experiments were observed to be similar. This suggests that absorption of radio-active phosphorus by calcified tissues may be a simple physical process.—*G. Bevelander.*

A Method of Recording and Scoring Gross Carious Lesions in the Molar Teeth of Syrian Hamsters. By Paul H. Keyes. J. D. Res. 23:439, December 1944.

A recording system for charting and scoring gross carious lesions in the molar teeth of Syrian hamsters is based on the assumption that the lesions represent true dental caries, that their etiology is essentially the

same and that the quantity of tooth substance destroyed is indicative of caries activity and may be used as a basis for numerical scores.

Lesions are recorded on a chart, which indicates location, type and extent of cavitation. Cavity size is evaluated and numerically scored on the basis of the quantity of tooth substance destroyed. Since cavity scores are theoretically linear, they may be added and applied to determine the approximate extent of destruction, if desired. —*Paul H. Keyes.*

Use of Vitamin K in Cases of Hemorrhage After Extraction. By M. S. Goldberg and E. Y. Milgram. Stomatologia, No. 2, 1943, p. 40; abstr. Am. Rev. Soviet. Med. 2:272, February 1945.

Vitamin K_3, methylnaphthoquinone, has been shown to have an antihemorrhagic action when the prothrombin level is normal. In this series of experiments, a 1 per cent alcoholic solution of vitamin K_3 was used. One cubic centimeter of the solution was distilled in 10 cc. of alcohol and 10 cc. of distilled water. This was administered daily for three days before the operation. Vitamin K_3 was also of value in accelerating the healing process. Healing occurred in the average case within three to four weeks, but with vitamin K_3 was reduced to two weeks. —*J. E. Gilda.*

Congenital Malformations Induced by Maternal Nutritional Deficiency. By Josef Warkany.

THE amount of riboflavin present has a decisive influence on the developing rat embryo. About the thirteenth day of gestation, undifferentiated mesenchymal structures develop into differentiated membranous skeletal elements, the forerunners of cartilage and bone. This change from mesenchyme into the membranous skeleton seems to be impeded in the presence of a riboflavin deficiency. Skeletal defects, such as shortness of the mandible, radius or ulna and cleft palate, are the results. Riboflavin, a vitamin known to be necessary for normal growth, is apparently necessary for normal embryonic differentiation in rats.—*J. Pediat.* 25:476, December 1944.

Salicylate Poisoning. By M. M. Troll and M. L. Menten. Am. J. Dis. Child. 69:37, January 1945.

In four cases of salicylate intoxication in four children aged 2, 2½, 11 and 7½ years, respectively, the first three cases were fatal, but, in the fourth case, there was recovery after prompt discontinuance of the drug and institution of hydration. Of the four cases of poisoning, one was from accidental swallowing of oil of wintergreen, one from prolonged acetyl salicylic acid therapy, one from therapy with methyl salicylate, sodium salicylate and acetyl salicylic acid and the last from methyl salicylate treatment of a swollen and tender ankle. While most of the deaths reported in the literature have been caused by administration of methyl salicylate, other salicylates are also toxic, and an increasing number of cases of poisoning have been reported as following their therapeutic administration in recent years. This fact should be borne in mind with regard to patients under salicylate therapy.—*S. W. Leung.*

Student Survey and Diagnosis of the Partially Edentulous Patient. By Paul L. Chevalier. J. D. Educ. 9:128, December 1944.

Persons seeking treatment at the clinic of the Medical College of Virginia, School of Dentistry, receive a comprehensive oral examination. After the study has been completed, the student tabulates his findings, writes a diagnosis and outlines in detail a plan of treatment. This material, together with mounted study casts and a complete set of roentgenographic films, is then presented to the various departments concerned. The instructors in these departments review the case with the student and either accept or reject the proposed plan of treatment. If this plan is changed by an instructor, the student is given the reasons for his decision —*Paul L. Chevalier.*

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CALENDAR OF MEETINGS

National

American Dental Assistants' Association, Chicago, September 16-18. Aileen M. Ferguson, 709 Centre St., Jamaica Plain 30, Mass., General Secretary.

American Dental Hygienists' Association, Chicago, September 17-19. A. Rebekah Fisk, 1704 N. Troy St., Arlington, Va., Secretary.

American Dietetic Association, Cincinnati, October 15-19.

National Board of Dental Examiners, August 20-21. Gordon L. Teall, Box 71, Hiawatha, Kan., Secretary.

Montreal Dental Club Annual Fall Clinic, October 24-26. M. L. Donigan, Drummond Medical Bldg., Montreal, Director.

State

Arizona: State Dental Board, Phoenix, October 10. R. K. Trueblood, 25 N. Second Ave., Glendale, Secretary.

District of Columbia: Dental Society, Washington, second Tuesday of each month. J. Walter Bernhard, 1835 Eye St., N.W., Washington, Secretary.

Indiana: State Board of Dental Examiners, Indianapolis, August 27-30. Carl A. Frech, Gary National Bank Bldg., Gary, Secretary.

Michigan: Detroit's Fourth Annual Dental Review, November 8. Raymond W. Walmoth, 4421 Woodward Ave., Detroit 1, Chairman.

Minnesota: State Board of Dental Examiners, Minneapolis, August 27-September 1. G. R. Metcalf, Barnesville, Secretary.

Nebraska: Board of Dental Examiners, Lincoln, August 22-25. C. A. Bumstead, 924 Stuart Bldg., Lincoln, Secretary.

New York: Dental Society of State of, New York City, May 13-16. Charles A. Wilkie, Secretary.

Texas: State Board of Dental Examiners, Dallas, August 27-29; Houston, August 30-September 1 and September 2-3. R. T. Weber, Austin, Secretary.

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Carnegie Fellowships for Research and Graduate Work in the Dental Sciences, University of Rochester. George H. Whipple, Rochester, Dean.

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